Scientific American.

THE ADVOCATE OF INDUSTRY, AND JOURNAL OF SCIENTIFIC, MECHANICAL, AND OTHER IMPROVEMENTS.

VOLUME XI. NEW-YORK, NOVEMBER 24, 1855. NUMBER 11.

THE
Scientific American,
PUBLISHED WEEKLY
At 128 Fulton Street, N. Y. (Sun Buildings.)
BY MUNN & COMPANY.

O. D. MUNN, S. H. WALES, A. E. BEACH.

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Single copies of the paper are on sale at all the periodical stores in this city, Brooklyn, and Jersey City.

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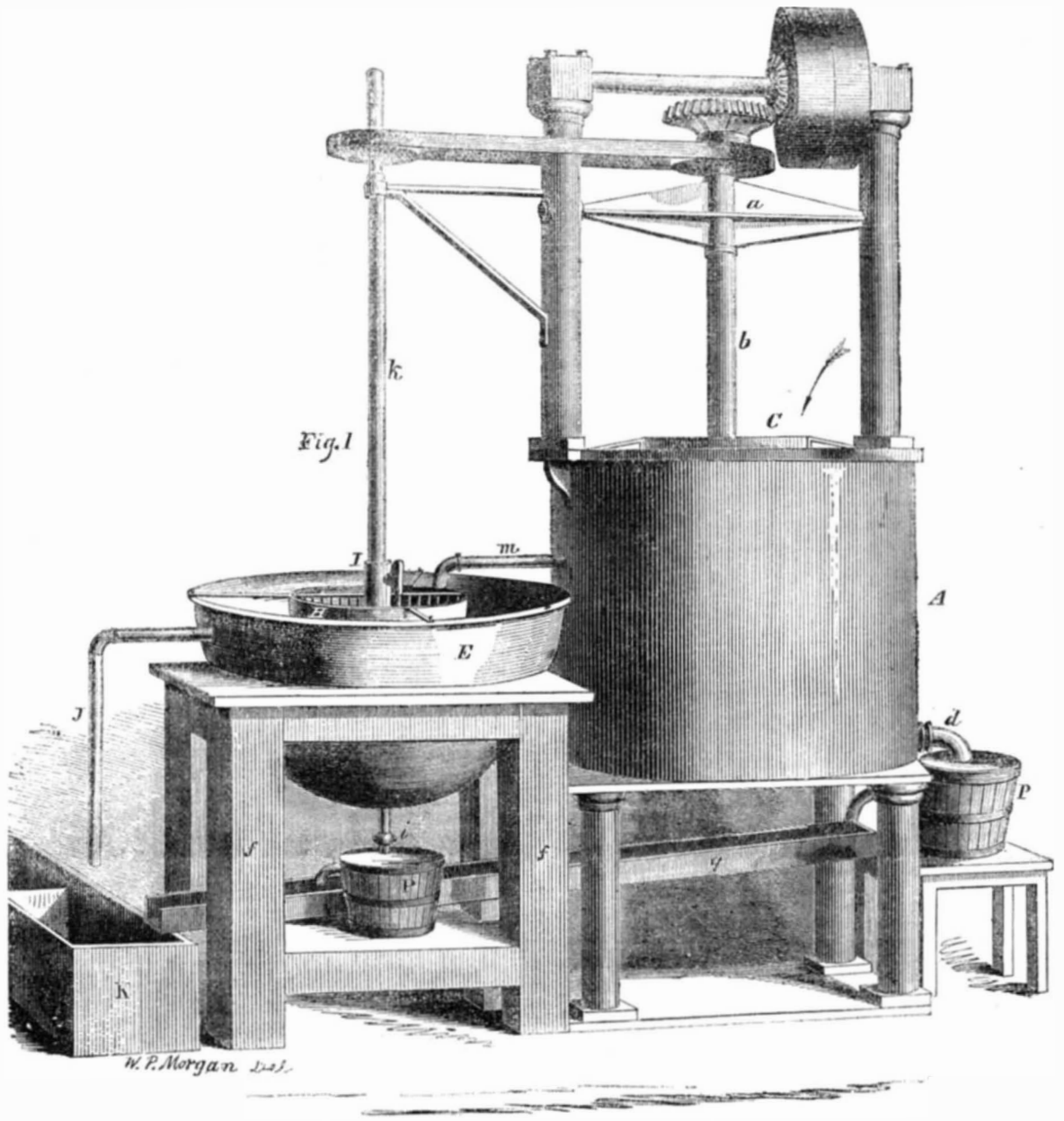
KENT'S APPARATUS FOR SEPARATING GOLD AND OTHER PRECIOUS METALS.



Gold-Separating Apparatus.

The accompanying engravings are views representing an improved apparatus invented by Edward N. Kent, Chemist, No. 116 John St., Melter and Refiner in the United States Assay Office, this city.

Figure 1 is a perspective view of the apparatus, and fig. 2, (on page 84,) is a longitudinal vertical section. Similar letters refer to like parts on both figures.

This apparatus is the result of a long and patient investigation, based upon experiments by the inventor, in connection with his duties in the Assay Office. During this investigation it was found that no mechanical process alone, and no amalgamator alone, were sufficient to remove all the precious metals contained in earthy or stony substances. To accomplish this object it was necessary to combine the mechanical and chemical processes—after having perfected them to the greatest possible extent—and by so doing, the great desideratum has been obtained.

A represents a strong iron vessel with a flat bottom, and capable of holding a large body of water, and two heavy wheels used for grinding. It is supported at a convenient hight by four legs, and surmounted by two pillars which support the cross-head, *a*, and the machinery suitable for giving motion to the shafts, *b* and *k*. B B (fig. 2) are two solid cast-iron wheels, running vertically under water, and which revolve on their own axis around the shaft, *b*, upon a thick plate of chilled iron, *c*, resting upon the bottom of the vessel, A. For convenience of removing or changing this iron plate, and to prevent waste of iron, it is made to correspond in size to a circle a little wider than that which is formed by the rotation of the wheels around the shaft, *b*, and the intermediate spaces are filled loosely with wood or cement, or they may be allowed to fill with the powdered ore, to the hight of the iron plate, so as to form a surface level with the cock, *d*. The axle of these wheels, B B, is made to fit loosely on the shaft and key, so as to rise up when necessary, and is made to turn with the shaft by means of the key or feather, which is firmly attached to the shaft. C (fig. 2) is an iron pan or hopper that serves to separate the metallic grains from the previously crushed ore, or earthy matters, which are supplied to the apparatus. This hopper is supported by arms, *e*, which rest upon the upper rim of the vessel, A, and keep it stationary by its own weight. At the bottom of the hopper is a large tube, *r*, through which shaft *b* passes, leaving a space between the tube and shaft for conducting the earthy matters into and under the surface of the water; this tube extends above the bottom of the pan, which is inclined upwards for a short distance, to form the connection with the upper edge of the tube, thus elevated above the bottom of the pan. D is a round iron plate within the hopper, C, with a socket and thumb-screw at the top, by which it is attached to and revolves with the shaft, *b*, and is supplied with a number of teeth on the lower side, nearly touching the bottom of the hopper. G (fig. 2,) is a flat scraper of wood or iron, which is keyed to the bottom of the shaft, *b*, and serves to keep the center of the mill clear, and conduct the earthy matters which fall to the bottom, under the wheels, B B, and is used, also, for cleaning the mill, by opening the cock, *d*, while the shaft is in motion. E (figs. 1 and 2,) is a semicircular iron vessel, capable of holding a large body of water, and supported by the frame-work, *f f*, at a convenient hight to receive the overflow from the mill, A, which passes through the pipe, *m*, into the pan, H, which is in the center of the vessel, E. F F (fig. 2,) are two paddle or water wheels, with solid sides, hollow axles, and furnished each with wooden or iron paddles, *h*. These wheels revolve vertically, under water, on their own axis, and around the shaft, *k*, to which they are firmly keyed, and which is put in motion by the belt and pulleys, *v v*, the upper edges bearing with friction against the bottom of the pan, H, and the lower edges just skimming over the surface of the mercury, *g*, which is contained in the bottom of the vessel, E, and is entirely unobstructed by any projection from the bottom which would cause the earth or sand to remain. The shaft, *k*, and wheels, F F, are supported by a collar, *s*, and bracket, *t t*, the latter being bolted to one of the pillars of the mill, A. The cock, *i*, is for drawing off the mercury preparatory to straining and distillation, to obtain the gold or silver contained therein. H (fig. 2,) is a heavy iron pan, resting upon, and with sufficient friction to turn, the paddle-wheels, F F, upon their own axis. This pan is confined to the center of the vessel, E, by arms bolted to the sides of the latter. In the center of this pan is a short tube, through which the shaft, *k*, passes; and outside of this center tube are several smaller tubes, *l l*, level with the upper surface of the bottom of the pan, but projecting below it nearly to the axle of the wheel, F F. I is a tube connected with two arms supplied with teeth, and a thumb-screw by which it is attached to and revolves with the shaft, *k*, the teeth nearly touching the bottom of the stationary pan, H, and serving to keep the latter free from deposits of earth or sand. J (figs. 1 and 2,) is an iron pipe connected with the upper part of the vessel, E, for discharging the overflow into the trap-boxes, K, the use of which will be presently described. P P (figs. 1 and 2,) are pails or tubs, with overflow pipes for conducting water into the trap-boxes, K, through the trough, *q*, when the mill, A, or amalgamator, E, are to be cleaned or repaired.

This apparatus may be used with steam water, or horse power, which should be applied in such a manner as to give the shaft, *b*, from twenty-five to thirty revolutions per minute.

OPERATION—The earth, or other substance to be washed for gold, silver, or other precious metal, should, if necessary, be previously prepared, so as to render it suitable to enter the hopper, C. Quartz, ores, and other hard substances, such as old crucibles and refiner's sweep, should first be crushed or stamped, (but not ground,) by a Chilian mill or other powerful machinery, and thus rendered as fine as possible without grinding the gold to powder, so as to liberate the larger metallic grains before entering the hopper, in which the largest and most valuable portion of the precious metal is speedily separated, and saved from further abrasion and loss. Earth, clay, sand, or river mud do not require to be crushed or stamped, but these substances should be passed through a coarse sieve to remove pebbles, &c., which contain no gold, and which would stop up the tubes of the apparatus. The earthy portion may then be passed through the hopper.

On commencing the operation of separating gold or other precious metals from the substances prepared as stated, the apparatus is to be set in motion, and a small stream of water allowed to pass into it through the hopper, C, filling the mill, A, thence through the pipe, *m*, inio the pan, H, and through the pipes, *l l*, filling the vessel, E, and finally through the pipe, J, into the box, K, from which it may be allowed to escape; or, if necessary, used over again, after the earthy matters have settled. The course of the current of water is shown by following the direction of the arrows in fig. 2. This current of water must be supplied in such a manner that it can be properly regulated or cut off when necessary, and the pipe should terminate over the hopper with a short piece of flexible tube or a movable trough, so as to be removed or turned aside when the plate, D, is raised up for removing the gold from the separator, C.

The earthy matters which have been prepared as directed, are then to be supplied gradually, at the rate of about two bushels per

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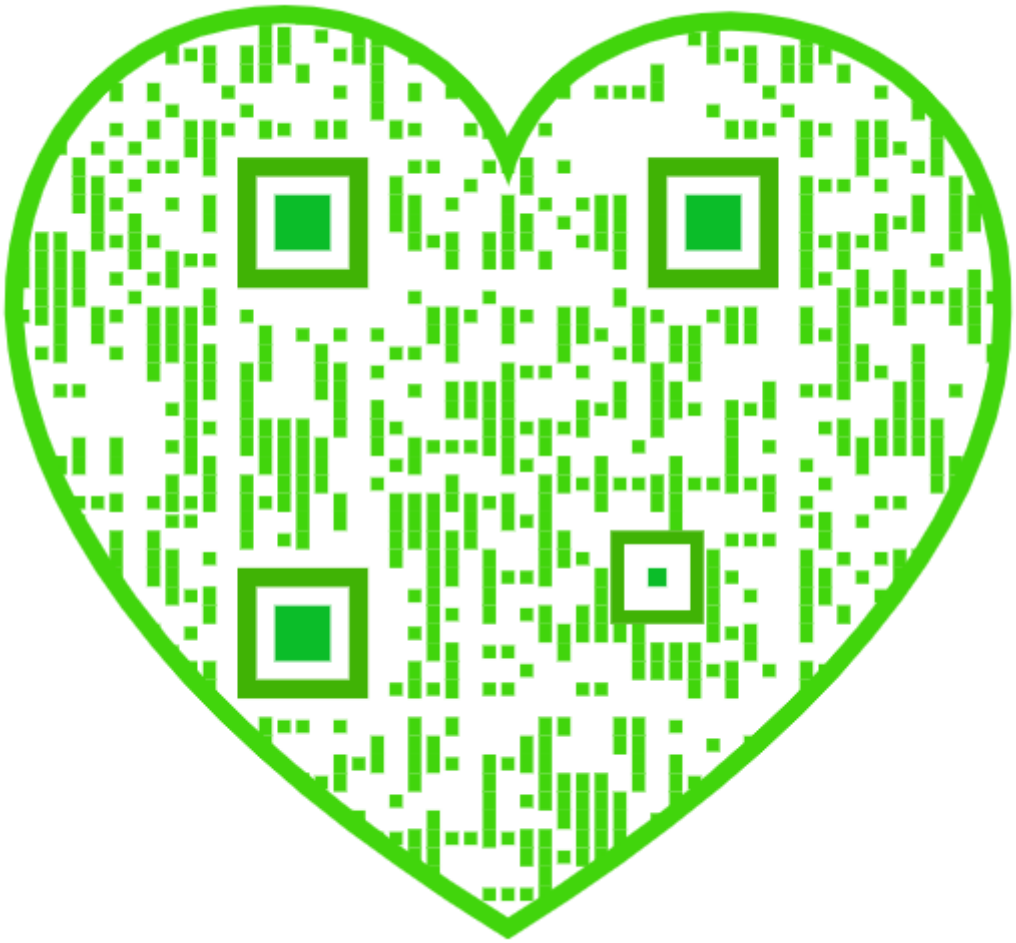

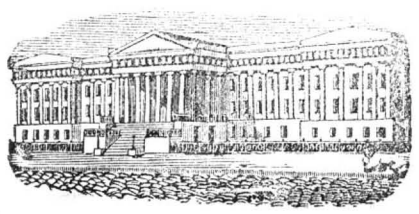

[Reported Officially for the Scientific American.]

LIST OF PATENT CLAIMS

Issued from the United States Patent Office

FOR THE WEEK ENDING NOV. 13, 1855.

MARBLE SAWING MACHINE—G. W. Bishup, of Brooklyn, N. Y. : I claim operating the saws of stone sawing machines, by placing the lever, H, on a tube, S, which has an internal screw thread cut into it, and is fitted on a screw rod, r, substantially as shown, whereby the lever, H, may, by turning the tube, S, be raised or lowered, to suit the hight of the sashes, as set forth.

[No adjustment or movement of the saws independently of their gates occurs in the above device. The necessary change of angle at which the saws are to cut is produced by shifting the entire frames in which the saws run. This is done by means of adjusting screws. If the frames are set at opposite angles, two tapering sides of a block of marble will be cut at once. In this improvement there is also a novel arrangement of parts for operating both saws from one crank shaft, which would require a diagram to illustrate.]

HANGING CARRIAGE BODIES—Ansel W. Porter, of Little Falls, N. Y. : I claim the free roller connection between the carriage body and the longitudinal levers, as described, for permitting all shocks to be conveyed through the said levers to the springs, without direct action on the body, as set forth.

UPSETTING TIRE, &c.—Hiram Abbott, of Wakeman, O. : I do not claim to have discovered any new method of constructing levers, or adjustable jaws, or eccentric, or spiral springs or slots.

But I claim the arrangement of the parts of my machine, to wit, the bed plate, A, the adjustable jaws, B B, operated upon by the eccentric levers, C C, and spiral springs, the eccentric levers, C C, the elongated jaws, D D, which form the slot, as described, by being inserted or diminished in width, through the agency of the eccentric lever, E, and the spiral springs, the levers, F and G, and the eccentric lever, E, all as described.

LASTING AND APPLYING SOLES TO SHOES—Chas. Rice, of Boston, Mass., & S. H. Whorf, of Roxbury, Mass : We claim the holding clamp, B, and last, A, as used together, and in connection with the pressing or puncturing mechanism, or both, for the purpose of fixing soles to shoes by cement, substantially as set forth.

COMPOUND PROJECTILE—Sylvanus Sawyer, of Fitchburgh, Mass. : I claim combining with the butt or flat rear end of the cylindro-conical iron shell, a layer of lead or softer metal than that of which the body of the shell is composed, and united or not to a layer of such metal, extended around the sides of the shell, as described, the same operating in manner as specified, while the shell is being projected through the bore of a gun by a discharge of the powder therein.

WEIGHING ATTACHMENT FOR FAUCETS.—JobBrown, of Lawn Ridge, Ill. : I claim attaching or connecting the frame, F, to the scale beam, G, by means of the pulley, f, resting upon the short end of the beam, and attaching a cord, g, to the platform, b, of the frame, F, and the gate or spigot of a faucet of the vessel, A, the above parts being arranged substantially as shown, for the purpose specified.

[Mr. Brown's improvement consists in arranging a sort of sling in front of the barrel out of which the liquids are to be drawn, and attaching the sling to one end of the weighing scales. The vessel into which the liquid is to be drawn is placed on the sling, and the faucet opened. A cord or rod so connects the scale beam with the faucet that when a given weight of the liquid has passed into the vessel, the beam falls, and instantly shuts the faucet. This contrivance, it will be seen, is unerring, for it is self-acting. The expense of construction is small.]

RING AND GUDGEONS FOR BOTTLE FASTENINGS—J. C. Day, of Hackettstown, N. J. : I claim, first, the construction of the hoop, b, with two gudgeons thereon, one of which is made open or divided in halves, and which, when in actual use, are brought together—thereby forming one gudgeon, which, with that on the opposite side, are the recipients of the gudgeon boxes represented by the letters c'' c'', fig. 4.

Second, I claim securing the two half gudgeons, c' c', together, and consequently the collar to the bottle, by means of one of the gudgeon boxes of the bail.

SUPPORTING JACKS—John Fouser, of Philadelphia, Pa. : I claim the lever, E, with its sliding block, B, having any convenient number of recesses, e, in combination with the adjustable screw coupling, H, and its sliding block, C, arranged and constructed substantially in the manner and for the purpose set forth.

MARBLE SAWING—L. B. Fisher, of Branch County, Mich. : I claim operating the frames of stone sawing machines, by means of the segments, J J, in combination with braces, o o o, arm, k, and chains or straps, s s s s, for the purposes and in the manner set forth.

SEPARATING PINS—Thaddeus Fowler, of Waterbury, Conn. : I claim the method of separating the imperfect from the perfect pins, by the use of an endless apron, having both a longitudinal and a lateral oscillating, or rocking motion, when constructed and made to operate, substantially as described.

ROTARY ENGINES—John H. Hathaway, of Millbury, Mass. : I do not claim the use of a circular, or nearly so, aperture in A, when the head, or abutments, are moved in other ways: nor the precise form or arrangements of the parts described.

But I claim moving the head, F, by means of a radial arm, having its center of motion corresponding to the center of the shaft, so as to withdraw the head from the cylinder, before elevating it, in the manner and for the purposes set forth, or any other, substantially the same.

LATHE CHUCK—Eli Horton, of Windsor Locks, Conn. : I claim, in combination with the opening, H, on the front plate, for the introduction of the solid jaws, the hub, L, on the back plate, for closing said opening, and retaining the jaws in their respective slots, substantially as described.

I also claim the locating of the circular rack in the deep recess, or groove, formed between the flanges, F Z, which not only form a tight casing, to protect it from chips, filings, &c., but also support it, as well as the shanks of the screw bolts, substantially as set forth.

MARBLE SAWING MACHINE—W. B. Kimball, of Peterborough, N. H. : I claim driving the saw frames or gates, B B, by means of the jointed pitmans, F F, and bar, G, in combination with the geared segment, H, and crank, K, when arranged as shown, and for the purpose set forth, and not otherwise.

[The nature of the invention consists in having the saw frames or gates work within adjustable guides, where by the saws may be set obliquely; also in a peculiar mode of driving the saws, whereby two saws, each cutting at a different angle, may be driven from one crank or shaft.]

CUTTING BOOT AND SHOE UPPERS—Jean Pierre Molliere, of Lyons, France. Patented in France Aug. 19, 1854 : I claim by Letters Patent, of even date with the French Letters Patent, for the same invention, the use of a large bed plate, pressed up against a resisting body by steam, or other equivalent power, by which a large number of different parts are cut out from a skin, by different cutters, at the same time, substantially as described.

EXCLUDING DUST FROM RAILROAD CARS—V. P. Corbett, of New York City : I claim, first, the employment of the valves, E E', on the ends of the chambers, D, when said valves are so constructed as to leave small exhaust passages, f f, when closed, between the bottom of the valves and the car, and so arranged that one of them, E, for instance, shall be open, while the other, E', is closed, as the car travels in one direction, and vice versa, if traveling in an opposite direction, substantially as and for the purposes set forth.

Second, having the mouth, C', of the pipe, C, elevated above the highest point of the escape passages, f f, in combination with the construction, arrangement and operation of the valves, E E', and chamber, D, substantially as and for the purpose set forth.

[This ventilator is a very simple affair. Boxes are placed on the top of the car, open at both ends, but covering an aperture through the roof into the interior of the vehicle. A fine gauze covers the aperture. There is a swinging or flap valve at each end of the box; both of them open inwardly. When the car is in motion, the pressure of the atmosphere opens one valve but closes the other, and thus the air is forced down through the gauze into the car. The valves are not tight at the bottom; a small open space is purposely left, so that the dust or cinders, by their greater momentum, will be swept away through the box, while the purified air passes into the car. This invention was used last summer on the New York and New Haven railroad with success. It is probably the cheapest car ventilator out.]

BORING IMPLEMENTS.—Ransom Cook, of Shelburne Falls, Mass. : I am aware that some dies have been used in the manufacture of augers, but differing entirely from mine, and not accomplishing the same purposes. I therefore merely claim the method described, of forging and shaping the lips and heads of the particular kind of boring implements set forth, by the successive stages of die stamping, substantially in the manner described.

WATER METER—Samuel Krauser and Christian Ritter, of Reading, Pa. : We are aware that the dividing of the gas which passes through a gas meter into two or more portions, and ascertaining the whole quantity by measuring a part thereof, when under pressure, instead of measuring all the gas which passes through the meter, as heretofore, has been used. This we do not claim.

But we claim, first, measuring or indicating the passage of a quantity of water through a pipe, by allowing a small graduated portion thereof to escape, and waste into a measuring and retaining receiver, or other vessel employed for that purpose, by means substantiallly as described.

We also claim, in combination with the rod. c, and plug, f, the spring and adjusting screws for the purpose of regulating the passage for the water through and into the meter, as set forth.

We also claim the drip, in rear of the plug, to cause the water from the slot to drop into the funnel. and thence into the receiver, as specified.

We also claim the inclined angular recesses on each side of the slot, on the inner face of the plate, f, for the purpose of carrying away from the slot any impurity or solid matter in the water, as described.

MARBLE SAWING—Wm. C. Chipman, of Sandwich, Mass. : I claim the rollers, d d d d, when arranged in the manner and for the purpose stated.

HANGING WINDOW SASHES—Michael Bomberger, of Hummelstown, Pa. : I claim the application to window frames in which ropes and pulleys are used to support the sash of the piece described, called the "rope hider," using, for the purpose of concealing from view the ropes and pulleys, a strip of wood, or piece of any other material, which will produce the intended effect.

SELF-FEATHERING ADJUSTING TIDE WHEEL—R. L. Nelson, of Ocala, Fla. : I claim the arrangement of the floating cam, and the floating self-feathering blades or buckets, when said cam and blades are made to rise and fall with the rise and fall of the stream, or water, that drives the wheel, substantially as described.

I also claim, in combination with a tide or current water wheel, the self-acting water brake, for causing the variable force of the current to be applied to the regulating of the speed of the wheel, substantially as described.

CORN PLANTERS—T. R. Markillie, of Winchester, Ill. : I claim the reciprocatting weighted markers, l, acting substantially as described, to perform the double function of operating the planting apparatus and making the hills, as specified.

THROSTLE FRAMES—Joseph Morse, of Woonsocket, R. I. : I do not claim driving all the spindles or throstles of a spinning frame by means of a single endless band, as I am aware that an endless band has been used for that purpose, but without success, owing to the want of proper means of compensating for stretching and shrinkage which rendered it more objectionable than the employment of a separate band for each spindle; neither do I claim, of itself, the keeping of a band of a machine tight, by a weight, as I am aware that a weight has been employed for that purpose in some machines.

But I claim the arrangement of the endless band, b b b, to run to and fro between every one of the spindles, and the drum, D, and around a pulley, d, carried by a slide, e, which is movable on suitable guides, and has a weight attached to it by a cord, h, so arranged as to draw the said slide in the proper direction, to produce tension on the band, substantially as described.

[The spindles in cotton frames are at present arranged in two rows, and driven by means of separate bands, which connect with and receive motion from a long pulley shaft that extends the whole length of the spindle frame between the rows. Great difficulty is often experienced to keep up the spindles to the proper degree of speed. If the atmosphere is damp the bands slacken; if the air is very dry, the bands become too tight, and produce friction; this friction of each spindle, taken singly, is of no consequence, but, in the aggregate, forms a serious disadvantage.

Mr. Morse's improvement consists in driving the whole of the spindles by one endless band, and in the arrangement of a weight apparatus, so as to keep the band always at an even tension, irrespective of atmospheric influences. The band passes zig-zag from one spindle around the other, and thus the proper contact is secured. This is an excellent improvement, and we doubt not will be highly appreciated.]

SEEDING MACHINES—E. D. Curtis, of Mt. Morris, N. Y. : I do not claim the distributing tube. made with forks or branches, for the better distribution of the seed, in sowing broadcast, as such has before been done; nor yet, of itself, irrespective of its construction, arrangement, and operation, substantially as specified, the combination of a leaf or flap valve, with a distributing tube for governing the discharge of the seed.

But I claim providing the forked distributing tube with a wedge-shaped flap valve, i, arranged in relation to the forks, as and for operation in the manner and for the purposes substantially as specified.

[One of the novel parts in this improvement consists in arranging the seed box at an angle across the frame of the vehicle, instead of placing it straight across, as in common seed drills. Mr. Curtis also secures his seed tubes and plow shares on an angle the same as that of the seed box; one share is thus in advance of the other; the furrow opened by the first share is covered by the next share in the act of opening its own furrow, and so on with all, no extra covering apparatus being required. This diagonal arrangement also enables the drills to be placed nearer together than they otherwise could be; so near, in truth, that the machine becomes, in effect, a broadcast sower. The seed tubes are forked at their upper ends, each division having a valve. If it is wanted to widen the drills, or to sow in hills, an adjustment of the valves at once effects the change. Taken altogether this invention appears to be an unusually good one. It is light, easy, and convenient of management.]

RAISING ICE FROM RIVERS, &c.—Cornelius R. Wortendyke, of New York City : I claim the method set forth of adapting the ice-elevating chain to work under changes in the level of the water by jointing the frame-work, carrying the lower wheel of said elevating chain to the lower end of the fixed incline, and sustaining the said frame work wheel and chain on scows or floats, substantially as specified.

I also claim the movable bottom, p, fitted and arranged as specified, to pass the ice from the movable to the stationary part of the incline, in the manner specified.

And I also claim, in combination with the frame-work, jointed to the lower end of the fixed incline, carrying the lower wheel of the elevating chain, the adjustable slide journal boxes, and screws, for regulating the tension of said elevating chain, as the water rises or falls, as specified.

I also claim making the rear part of the shell tapering or conical, as seen at a a, combining therewith a ring or annulus, b b, of lead, or its equivalent, the same being substantially in the manner and for the purpose specified.

I also claim confining the explosive screw cap to the body of the shell, by means of a softer, or yielding metal, or casing, which, when the cap or shell strikes an object, shall give away, under the force of the blow, and let the cap down with force, so as to compress the percussion wafer or priming in it, or on the main screw, stopper, or plug, and so as to create an explosion thereof, as stated.

MACHINES FOR ADDING NUMBERS—Nath. S. Saxton, of Riverhead, N. Y. : The retrograde motion of wheel No. 1, may, in some cases, be performed by a weight or spring; but that part is not claimed to be patented.

I claim, in machines for adding numbers, the spiral scale of numbers, combined with the traversing gnoman, substantially in the manner and for the purpose set forth.

PREPARING ARTIFICIAL TEETH—Barclay A. Satterthwait, of Lima, O. : I do not claim the compounding the material or enamel, or modeling around teeth, to be connected to metallic plates, in the form of block-work, or continuous gum; neither do I claim the carving upper or lower sets out of one piece of porcelain material.

But I claim the described improvement in making whole or half sets of artificial teeth. gums, and plates entirely of porcelaim, by modeling porcelain material around porcelain teeth, or mounting porcelain teeth on porcelain plates, substantially as set forth.

ATTACHING SHAFTS TO AXLES—Thos. Chope, of Detroit, Mich. : I claim attaching the shafts, B B, to the front axle, A, by means of the curved plates, C C, attached to the back ends of the shafts and the cylinder, c, secured in the ends of the projections, D, which are attached to the front axle, the cylinder, c, having notches, e, made in their peripheries, to receive the lips, a, on the ends of the plates, C, substantially as shown and described.

[The ordinary mode of attaching the front wheels of vehicles to the body part, by a king-bolt, renders the axle-tree weak in its center, owing to the hole required for the bolt. One portion of the improvements patented above consists in dispensing with the king-bolt, and making the attachment without boring the axle. This is done by means of two T-shaped plates, which are attached one to the reach and one to the body; these plates are slotted and connected through the slots by means of bolts, so that not only may a vehicle thus provided turn as easily as by the common method, but it will turn in a circle of much smaller dimensions. There are other advantages, but those we have named are sufficient to indicate the general excellence of the invention.]

REFRIGERATORS—D. W. C. Sanford, of Cincinnati, O. : I am aware that various modes have been tried and used for circulating air in refrigerators; but I am not aware that, in any instance, a complete and continued rotation, purification, desiccation, and refrigeration of the whole of the contained air of the refrigerator has been compelled, as it is in my invention.

I claim the arrangement set forth for causing the perpetual rotation of the whole of the air contained within the refrigerating apartments—said arrangements consisting, when the refrigerator is closed, of an endless passage or chamber—the walls, shelves, and ice receptacle of which are so placed and constructed that the air is compelled to circulate through the entire apartment or apartments, and from which the water of the melting ice is discharged immediately from the refrigerator, instead of flowing between its walls, the whole being constructed as set forth.

STRAW CUTTERS—Loren J. Wicks, of Paterson, N. J. : I do not claim the elastic or self-adjusting throat, as that has been heretofore used; neither do I claim the adjustable throat to govern the length of the cut.

I claim hanging the knife to a crank shaft, J, and to a pivoted pitman, H, for the purpose of giving it the curvilinear motion described.

[One of the most prominent features of the above improvement consists in dispensing with the feeding apparatus. The straw is pulled out as fast as wanted, and to the proper distance, by the knife itself; the expense and complication of feed rollers is thus wholly avoided. An engraving would be required to show the manner in which the knife is made to feed as well as cut. The arrangement is very simple, cheap, and effective. The knife is set in a gate, which moves up and down in the usual manner; but the gate is made to describe part of a circle in its motions. It would almost seem that the day had gone by for good improvements in straw cutters, so many have been made; but here is one of decided novelty, and, we think, of real utility.]

FORMING HEADS ON BEDSTEAD SCREWS—H. N. Sherman, of Birmingham, Conn. : I do not claim the jaws, Q R, neither do I claim the cams upon the shaft, B, for operating the several levers, as shown, for they have been previously used for the same or for analogous purposes.

But I claim giving the levers, H H, to which the dies, I I, are attached three separate or distinct movements in succession; the first lateral movement causing the smaller parts of the dies at their inner ends to grasp the end of the rod; the second and sliding movement, causing the collar, c, to be formed, and the square, p, partially formed, and the third lateral movement, perfecting the square and completing the head, substantially as shown and described.

I further claim the combination of the dies, I I, when operated as shown, with the rod, J, operated as described, the rod, J, serving as a stop at the commencement of the operation, and also serving, subsequently, as a plunger, to compress the metal forming the square, p, snugly within the dies, I I.

[The nature of the above invention consists in the employment or use of two dies attached to levers, operated so that said dies have three movements, the first of which is to grasp the end of the rod; the second to upset or form the collar, and partially form the square, and the third to complete the square. There is also a combination of the two dies above mentioned with a movable head or step, for completing the heading operation. Without engravings it would be impossible clearly to describe the operations of the parts. It is sufficient to say that this machine, as we understand, makes bolt heads better, quicker, and cheaper than any other apparatus of its kind. It is an ingenious invention.]

SECURING SHAFTS TO AXLES—Alfred E. Smith, of Bronxville, N. Y. : I am aware that blocks of india rubber have been interposed between the ends of carriage shafts, or thills, and the metal clips attached to the axle to make pressure against the ends of the shafts, or thills, with the view to prevent wear, rattling, and accident; but as each block of india rubber is hollowed out in the front face, to fit the rounded end of the shaft, or thill, it will seriously impede the up-and-down motion of the horse, and the passage of the carriage over irregularities. I do not, therefore, mean to be understood as making claim to the use of springs or elastic substances at the connection of the shafts, or thill, with the axle, to prevent wear, rattling, noise, and accident.

I claim connecting the stems of the shafts, or thills, with the eye-staples, by means of a spring or springs, acting laterally against the faces of the eye staples, substantially as, and for the purpose specified.

MARBLE SAWING MACHINE—Geo. W. Hubbard of Middleton, Conn. : I claim constructing the adjustable guide F, and permanent guides, F', of stone sawing machines as shown and set forth.

[Mr. Hubbard's improvement is as follows:—The saws are strained in a common horizontal saw gate, and have lateral movement at their ends by means of slots in the gate. Another gate, on which there are adjustable guides but no saws, is placed above the saw gate; the saws pass through the guides, and are by them made to cut at any desired angle. This is a very easy and simple way of sawing out tapering blocks of marble.]

ARGAND GAS BURNERS—Chas. H. Johnson, of Boston, Mass. : I claim making the distributor with a catch lip, flanch, or spout, extending around its bottom, in the manner and for the purpose described.

I also claim combining with the argand burner a conical deflector, or the cone and its interior rod and bulb—the same being arranged in the middle of the air chamber of the burner, and for the purpose as set forth.

TOBACCO PRESSES—Rhudolphus Kinsley, of Lynchburgh, Va. : I claim the construction and employment of a press bar or compresser, substantially as described, in which the article to be compressed can be put, and placed under a press, and when compressed, can be retained in that position, and removed from the press, till set, while the press is liberated for the operations, all as set forth.

PLANING MACHINES—James A. Woodbury, of Winchester, Mass. : I claim making both of the edge cutters adjustable, in such manner that the board can be fed in from either side of the machine, double guides being provided for the purpose, as specified.

MARBLE SAWING MACHINE—Charles F. Warren, of Malden, Mass. : I claim giving the saws, G G, a lateral vibrating movement in the saw frame, C, as the saw frame and saws work longitudinally, by means of the rack, c, pinions, d, grooved, sectors, f, and racks, F, when arranged as described for the purpose specified, and not otherwise.

[The lateral relation of the saws, in this invention, is produced by racks and pinions, which are contained in boxes, one at each end of the saw gate. An engraving would be required fully to illustrate the plan. It is a novel way of causing the saws to cut at an angle, and we think will work well in practice.]

PROCESSES FOR MAKING ZINC WHITE—Samuel Wetherill, of Bethlehem, Pa. : I do not, in this application claim the construction or application of the furnace, so constructed to the working of the ores of zinc, for the production of the white oxyd of zinc, as it is my intention to make such claim in another application for letters patent; nor do I limit my claim to the working of my improved process in a furnace of the special construction specified, having simply described the construction of the furnace, as the one in which I have successfully worked my said process.

I claim the process of producing the white oxyd of zinc from the ore of that metal, by the direct application of the fuel to the ore, in the crushed state and in admixture therewith, in combination with a blast of atmospheric air, introduced in numerous small jets, to the charge of mixed ore and coal in a thin layer, substantially as specified.

ROAD SCRAPER—Reuben W. Oliver, of East Aurora, N. Y., assignor to himself and H. Hoyt, of same place : I do not claim making the hight of the scraper adjustable upon a frame supported upon wheels, as this has already been done.

But I claim supporting the forward end of the scraper upon levers, which rest upon the wheel, B, or their equivalent as a fulcrum, and extending back of the scraper for the purpose of operating conveniently the back end of the scraper, resting upon a fixed support, as set forth.

Second, I claim hanging the bottom of the scraper to the side, as set forth.

Third, I claim securing the return of bottom, E, to the position for loading, by the chains, P, or the equivalent, attached to the said bottom, M, and to the levers, F, as herein set forth, or any other manner, substantially the same.

NOTE—One-third of all the patents granted as above were obtained through the Scientific American Patent Office. The return of the Hon. Charles Mason to the post of Commissioner of Patents leads us to hope that the number of patents weekly issued will soon further be augmented and that much of the unfinished business of the Department will be closed up.

MARBLE SAWS—Six patents, it will be observed, were granted last week, four of which were obtained through he Scientific American Agency.

The Cost of Gas in Various Cities.

A correspondent of the Washington *Intelligencer* gives the following as the cost of gas to private consumers in forty-two of the largest cities in the United States :

"Boston, $3 per 1000 cubic feet; Hartford, $3,50; New Haven, $4; Providence, $3,50; New York, $3; Brooklyn, $3,50; Albany, $4; Troy, $4; Rochester, $3,50; Buffalo, $3,50; Auburn (rosin,) $7; Schenectady, $4; Syracuse, $4; Newark, $3,50; Paterson, $4; Philadelphia "City Works," $2,25; Northern Liberties, $3,50; Spring Garden, $3,50; Moyamensing, $3,50; Reading, $3,50; Lancester, $4; Baltimore, 3; Charleston, $4; Savannah, $4; New Orleans, $5; Galveston, $5: Mobile, $5; Nashville, $4; Memphis, $4; Louisville, $3,50; Cincinnati, $3,50; Indianapolis, $3,75; Chicago, $3,50; Milwaukie, $3,50; St. Louis, $3,50; Lexington, Ky., $4; Cleveland, $3,50; Springfield, $5; Dayton, $4; Columbus, $3,50; Wheeling, $3,50; San Francisco, $10—being an average of $3,97, or 17 cents per 1000 more than the cost of gas to private consumers in Washington city, which is $3,80 and 47 cents more than is paid by the government, the city hotels, &c."

A gallon of pure sperm oil produces light equal to 217 cubic feet of coal gas; a gallon of whale oil produces light equal to 175 cubic feet of coal gas. Therefore gas at $4 per 1000 cubic feet gives 250 feet for a dollar, and is therefore much cheaper than whale or sperm oil. The apparatus used for making gas, and the labor attending the production of it, however, involves an expense (it is considered) greater than the use of oil in lamps, under 100 burners. Over that number it is considered that gas is more economical than oil Any village, factory, or mill, therefore, using more than 100 burners, will find it more economical—and certainly much more convenient—to use gas rather than oil.

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Recent Foreign Inventions.

STEEL—S. Lucas, of Sheffield, England, has obtained a patent for a method of manufacturing steel—the object of which is to convert bar-iron into bar steel in the presence of iron ore, which ore will, at the same time, be itself converted into steel.

The bar-iron is piled up in layers in a converting furnace, and the layers are separated from each other by an intermediate layer of a compound of ingredients, consisting of broken iron ore, (or as a substitute for the ore, iron or steel scale, or iron or steel filings or turnings, or other irons in a state of oxyd,) manganese, or charcoal; all of which ingredients are to be mixed together in the following proportions:—The iron ore should be broken into small pieces about the size of a walnut: and to any given quantity thereof an equal quantity, by measure, of animal or vegetable charcoal, or other material is added, which, during the process of converting the iron, will become charcoal. To those ingredients 1-2 lb. of manganese is added for every cwt. of iron ore—more or less manganese being used, according to the degree of hardness desired to be obtained in the steel. These materials are to be mixed well together, and when charging the converting furnace a layer of charcoal is first placed on the floor, then a layer of the above mixture of iron ore, or scale, manganese, and charcoal; then a thin layer of charcoal; and on this is placed a layer of bar-iron; after that another layer of charcoal, and then a layer of the mixed ingredients above-mentioned; then another thin layer of charcoal; and after that a second layer of bar-iron; and so on until the furnace is charged, care being taken to keep the iron ore or scale from coming into actual contact with the bar-iron, as, should such be the case, there would be great liability of the lumps of ore adhering to the bars of iron. It is for this reason that a layer of charcoal is interposed between the ore and the bar iron. When the converting furnace has been thus charged it is heated in the usual way, and kept up to the degree known as a melting heat, until the desired change in the iron is obtained. The contents of the furnace are then allowed to cool in the ordinary way before being drawn; and when cold, the bar-iron will be found to be converted into steel, and will be ready for any of the uses to which it may be applied; and the iron ore, or the iron or steel scale that has been used in the process of converting the bar iron into steel, will also have become converted into steel; and when removed from the furnace it may be melted in pots, either alone or in combination with scraps of iron or steel, according to the quality of steel desired; or it may be made at once into bar-steel. When the converted ore is melted in pots to make cast-steel, the impurities contained in the ore become separated from the metal, and being lighter than the latter, will float on the top, and can either be removed or the steel poured out of the pots, leaving the impurities behind.

There is not much that is new in this process, yet the patentee states he can make steel by it at a less cost than by common processes.—Scrap iron is converted into steel in England by melting it with some charcoal and the oxyd of manganese in crucibles.

COPPER CASTINGS—W. Jenkins, of Neath Abbey, Glamorganshire, England, has patented a method of casting copper cylinders and vessels, for which purpose he employs a mold of iron, sand, loam, or other suitable material, made in three principal parts—viz.: the bottom, the outside jacket or mold, and the core. The core is supported at one end by a pin in its center falling into a hole into the bottom, and at the other end by another pin passing through a cross-head attached to the outer mold, so that the core is held in a suitable position in relation to the outer mold; the space between the core and the outer mold is to be made close at one end, and at the other to be open, so that a continuous passage or "git" is provided for the flow of the melted metal into the mold, a sufficient supply of which is to be kept up to keep this "git" closed, so that the space between the inner surface of the melted metal and the end of the chamber intended to receive it shall be excluded from communication with the atmosphere at the opposite end to the inlet or "git" end; a communication is to be made with a partially exhausted chamber, or an exhaust pump or pumps, so that the air in the chamber between the surface of the melted metal and the end of the mold, may be kept in a partially exhausted state, in order to facilitate the flow of the melted metal into it.

PLATES FOR TEETH—Charles Goodyear, Jr. now residing in Paris, has obtained a patent for constructing the plates of artificial teeth of a hard compound of india rubber and gutta percha mixed with sulplur, and submitted to a high degree of heat—a vulcanized compound of india rubber and gutta percha.

POLISHING POWDER—A. Davis, of London, has secured a patent for the following powder to be used for polishing metals. The proportions are 112 parts by weight of animal charcoal, 10 of whiting, and 5 of rottenstone. All these are ground to a fine paste with a little water, then dried and ground again to a very fine powder, passed through fine sieves, and is ready for use. This, we have no doubt, will make an excellent polishing powder.

MAKING LIGHT MORE BRILLIANT—J. Longbottom, of Leeds, England, has patented some improvemeuts in combining atmospheric air with hydro-carbons, for the purpose of producing light and heat. The invention consists in causing the atmospheric air, for the purpose of light and heat, to be passed in contact with pumice stone, or other porous substance, saturated with caustic potash, and then to be passed in contact with pumice stone, or other porous substance, saturated with sulphuric acid, in order to free the air from water. The dry and pure air is then placed in contact with the hydro-carbon, naphtha, or benzole, to be used, which, combining with the air, produces a compound suitable to be used in place of gas. The air is propelled through the process by bellows or blowing apparatus, and caused to pass into, and in contact with, the hydro-carbon employed in a divided or thin stream by means of cups and floats; the combined matters then pass into a gasometer, from which they are supplied for use in like manner as gas. By passing atmospheric air through a bath of pumice stone, or any other suitable porous substance, saturated with caustic potash, for the purpose of absorbing the carbonic acid gas contained in the air, and then through a bath of pumice stone, or other suitable porous substance, saturated with sulphuric acid, for the purpose of absorbing watery particles or aqueous vapors, and thus thoroughly desiccating or drying the air, and fitting it for the absorption of the vapors of hydro-carbons, it becomes, it is said, highly luminiferous, and well suited for all the purposes of which illuminating gas is susceptible.

This patent is secured for accomplishing the very opposite method of employing fluid hydro-carbons for illumination, as generally pursued, which is to drive the air through water, and the benzole, instead of depriving the air of the moisture contained in it. The dry air is the correct method to make the light burn more brilliant.

[Our Foreign Correspondence.]

The French Conservatoire des Arts.

PARIS, Oct. 22nd, 1855.

MESSRS. EDITORS—The "Conservatoire des Arts et Metiers" was founded some sixty years since, by the Bishop of Blois, and is now one of the government institutions of France. Its object is the improvement of machinery of every kind, by exhibiting working models of the best and most recent inventions, for the purpose of stimulating the creative faculty in the minds of other artists and mechanics.

In 1798, three expositories of machines which then existed in Paris, were amalgamated into this one, but it was not until 1838 that it was finally established under its present regulations. These instruments, from the simplest tool to the most complicated piece of mechanism, are collected and classified in the saloons of this building.

The style of the builing is Gothic, the principal entrance is through a solid archway, richly sculptured. Its curiosities are held in spacious apartments, communicating with lecture rooms of modern construction. The library, containing upwards of twenty thousand volumes, on mechanical, mathematical, and scientific subjects, is elegantly fitted up. It is divided by lofty pillars, the bases and capitals of which are richly gilt. Fresco figures of Chemistry, Natural Philosophy, Painting, and the Plastic Art, adorn the ceiling.

On the ground floor are arranged, in beautiful order, weighing machines, looms, spinning machines, printing presses, screw making machines, agricultural implements, specimens of porcelain, silk, glue, &c., and in an adjoining out house is Tuxford's locomobile engine, which gained the chief medal at the Exhibition in London of 1851. In the upper story are exhibited steam and fire engines, apparatus for lighting and heating, cranes, pulleys, musical instruments, mirrors, and a large collection of optical instruments. Among the turning lathes, I was much interested with one which (I was informed) formerly belonged to Louis XIV. It was elegantly adorned, but would scarcely be used now-a-days.

Large rooms are devoted to geometrical illustrations, to carpentry, to the making of compasses, to specimens of stereotype, furnaces, &c. Also to instruments belonging to the science of natural philosophy or physics; and to clocks and chronometers. The government seems determined that this museum shall embrace all that is new and useful in machinery; for this purpose they have purchased a number of foreign machines now on exhibition at the Crystal Palace in the Champs Elysee.

J. P. B.

[For the Scientific American.]

Inhalation in Lung Complaints.

In Schell's advertisement, he speaks of inhalation being a new mode of treatment for lung complaints. I am now eighty years old, and from the age of seven to the beginning of this century it was employed as a pneumatic medicine by inhalation. During my minority I was introduced to a scientific Quaker in London, whose sole business was the administering of compound gases by inhalation. The instruments then used were graded gasometers, to which were attached inhaling tubes. This mode of treatment was in disrepute among regular medical men, although many remarkable cures were made in bronchial and lung complaints. It is true that, when administered by unskillful persons, many also were injured. It has always surprised me that it should be totally neglected by the medical profession, and I am much pleased to see them bringing it into regular practice now. The earliest recollection I have is, that a Dr. Beddoes, of Bristol, England, was the originator of medical inhalation. In the old magazine edited by Sir Richard Phillips, an account was given of a British officer being cured of confirmed consumption by inhaling fumes from a compound mixture of resin, beeswax, and gum-lac. More than sixty years past I knew a young lady far gone in consumption being cured by inhaling gases containing less oxygen than atmospheric air. Fifty years ago a lady of my family became so weak as to require help to move about the house. Being free from consumption, I concluded that the carbon of the venous blood was not fully cleared out in passing through her lungs, and that this portion returning into the arteries, acted as a preventive to assimilation. aving a graded gasometer at the laboratory I was then engaged in, I brought it home, and caused her to inhale one gallon of oxygen gas, made from manganese, mixed with three gallons of common air. The first dose produced a decided favorable result, and after giving two doses a week for six weeks, she was as lively and as strong as ever; and during an after life of thirty-five years she never had a return of weakness.

A Mr. Knowlton, of Binghamton, has an inhaling pipe obtained from a Dr. Hunter, of New York, to which is attached a glass bulb. This instrument is, to me, entirely new, and well adapted to the purpose. By inhaling vapor from this instrument, he has been cured of a cough of a very distressing character, that no stomachic medicine could ever reach.

During the latter half of the last century, many diseases were professed to be cured by animal magnetizers, but those only could operate successfully who, in addition to their magnetic power, possessed the property of second sight. By possessing these two powers, they were enabled to sit in their closets, view their patients at hundreds of miles distance, examine their physical condition, and discover what dose of animal magnetism would effect a cure. I perceive by an advertisement in our country paper, that diseases can be cured at any distance from the city by the patient enclosing a dollar per post. As animal magnetism and second sight are now among the lost arts, and the employing of departed spirits has been recently discovered, I presume it must be through this *medium* the advertiser operates. How truly wonderful is the progress of human knowledge, for it not only gives us power in this life, but enables us to command the world of departed spirits! WM. PARTRIDGE.

Binghamton, Broome Co., N. Y., Nov. 1855.

To the Spirits—A Machine Wanted.

Mr. Alfred W. Eastman, of Dalton, N. H., sends us a challenge to the ghost-seers offering to pay five hundred dollars to any one of them who will furnish an accurate description of a machine invented by the father of said Eastman, who died without leaving any such description. The spirits must furnish an account which will suffice for the construction of a working model, whereupon the cash will be handed over to the medium. If they fail to do this Mr. E. declares that he will proclaim them before the world to be no spirits at all, but mere human deluders and imbeciles. If any body earns the proffered reward we hope to know it.—[N. Y. Tribune.

[This is a very fair offer, and affords a good opportunity for some of the mediums to show their relationship with the spirit of old Mr. Eastman.

Alcohol from Tomatoes.

In a recent experiment undertaken for the purpose of making vinegar out of tomatoes, by expressing the juice of the ripe fruit, and mixing therewith an equal quantity of water, I find that on exposing it to the weather, it ferments equal to any apple juice or cider I ever tried, but it has not yet passed through the acetic fermentation so as to make good vinegar. I am convinced by the experiment thus far tried, that the tomato possesses a considerable quantity of saccharine matter. This ingredient must subsist in all grains and fruits used for making distilled liquors—it being essential to produce the vinous fermentation in all such substances. Hence I infer that the tomato possesses a sufficient quantity of sugar to qualify it for making alcohol. But a chemical analysis of its properties, perhaps, would be the best way to test this. If this point is thus sustained, in my judgment, nothing cheaper can be employed in the manufacture of alcohol, for one acre of good land well cultivated, would produce, according to my calculation, not less than three tuns of tomatos. Further than this, the amount of alcohol produced is merely conjecture until tried. At all events, it is well worth an experiment, by reason of the high price of this article. J. VANHORN.

Lambertville, N. J., Nov. 1855.

How to Set Timber Posts.

MESSRS. EDITORS—As an item of interest to some of your readers, I here "drop" a little information derived from N. Coe, an old and experienced millwright in this place.

In repairing old mills, he says he has found it invariably the case that timbers planted with the butt end of the log up were almost as sound as when put in, while timbers planted with the butt down, although out of the same lot of trees, and subject to precisely the same influences, were so rotton as to resemble a honeycomb. Mr. Coe is entirely reliable in anything he says. P. N. G.

Grenada, Miss., Nov. 5, 1855.

Benzole for Insects.

M. Reynal, a veterinary surgeon, has discovered that benzole is fatal to parasites in animals, and he has employed it with success on animals. It is more safe than tobacco juice or mercurial ointment to be used on calves and sheep.

Fire Wood.

Fire wood is becoming scarce in Wisconsin and Illinois. The enormous consumption of it by railroads is fast exterminating the forests of our country. Two years ago the price of cordwood at Sodus Bay, N. Y., was $1,50 per cord; this year Canadians from Toronto came over and purchased all that could be furnished for $2,50 per cord.

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Continued from First Page.

hour, to the apparatus, through the hopper, C, in which the grains of gold or silver will be retained and cleaned by the action of the teeth on the under side of the plate, D, from the sand which would otherwise remain. If the motion of this plate be very slow, much sand will remain with the gold or other precious metals, and if too fast, some of the latter will be carried over in the current of water to the mill below, where it will be retained; but to perform its duty to the best advantage, this plate should revolve about twenty-five times a minute, by which the metallic grains are left clean and bright, and almost entirely free from sand, if the current of water be allowed to pass through the apparatus, in motion, for about two hours after the supply of earth has ceased. After the metallic grains have been thus separated by passing through the hopper, the earthy portion is carried by the current of water, through the tube, *r*, into and under the surface of the large body of water in the mill, A, the finer portions passing off with the current of water, into the pan, H, of the amalgamator, and the coarser portion, which is too heavy to be thus carried off, falls to the bottom of the mill, where it is ground and mixed up with the water until the earthy portion of this also passes off into the amalgamator, leaving a small residue, very rich in gold, at the bottom of the mill. This should be concentrated as much as possible, by keeping the apparatus in motion for about two hours after the supply of earth has ceased. In the use of this apparatus at the Assay Office, it is found that this residue, when from rich sweep, may be thus enriched so as to contain from one to two ounces of the precious metal to a pound; and when from the poorest ores or tailings of iron pyrites, which originally contain so little gold as to be invisible by panning, this residue may be thus enriched so as to contain from $1 to $6 per lb.

The earthy matters from which the greater portion of the gold or silver has been now extracted by mechanical means, pass from the mill into the pan, H, and are stirred up and suspended in the water by the teeth attached to the tube and arms, I, and are carried thence by the current of water through the small tubes, *l l*, into the center of the second large body of water contained in the vessel, E, and directly in contact with the mercury on the bottom, the surface of which is kept constantly clean by the revolving action of the paddle wheels around the shaft, *k*. This causes an outer current in the space between the wheels and the sides of the vessel, into which the earthy matters are thrown by the revolution of the paddle wheels upon their own axes, thus allowing the heavy metallic portions to fall by virtue of their greater specific gravity, and remain in contact with the clean mercury until amalgamated, while the light and refuse earth is rapidly washed away.

After leaving the amalgamator the refuse earth is conducted into the trap-box, K, where it is deposited, and may be subsequently examined, and its value (if any) ascertained. This, however, is necessary only in case of rich washing, such as refiner's sweep, which contains some metal combined with the borax and other fluxes used, and which can only be obtained by subsequent smelting. For quartz, earth, or other natural deposits containing gold or silver, these boxes may, without loss, be dispensed with, after these substances have passed through the apparatus in the manner described. But in localities where water is scarce, a number of such boxes can be used to great advantage, because the earthy matters will settle in them, and leave the water in the last box clear, and suitable for supplying the apparatus constantly and repeatedly with the same.

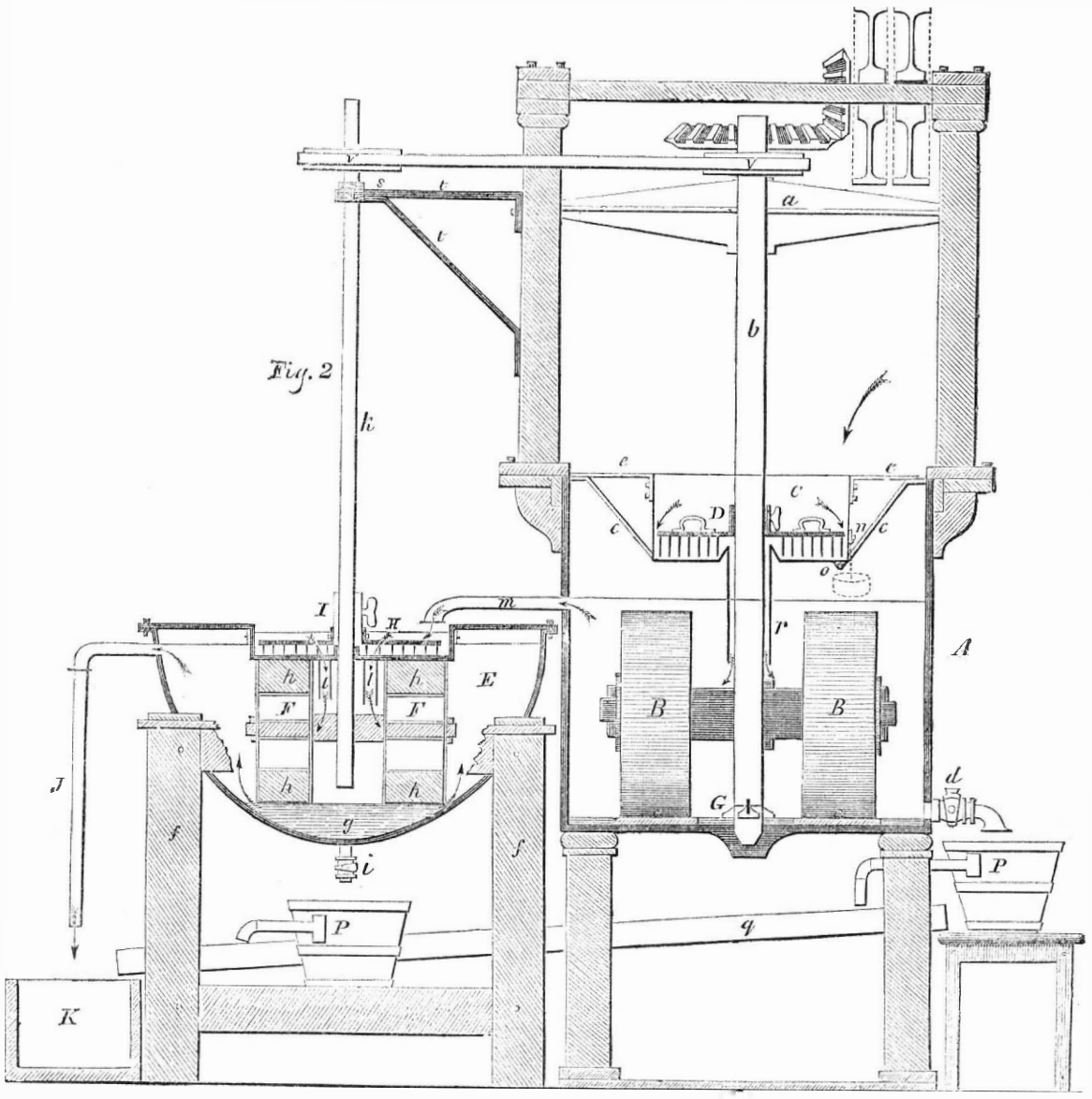
At the close of the operation for the day, the supply of water should be stopped, and the cock, *d*, should be opened for a few minutes, while the shaft, *b*, is still in motion, so as to draw off the small rich residue which remains at the bottom of the mill into a pail. This contains the dirty gold or silver, which cannot be separated by amalgamation, and by passing it again through the pan, C, on commencing operations for the next day, the gold or silver contained in it will be separated and cleaned.

When this residue is from refiner's sweep, (which contains sulphur, and generally a great deal of metallic iron,) it should first be roasted in a stove with a slow fire, to burn off the sulphur and oxydize the iron, and on passing the powdered ashes containing the burnt residue again through the apparatus, the gold will be separated as described. When from very poor ores or tailings, in which no visible grains can be seen by panning, Mr. Kent advises the miners to carefully save this rich residue, and after having it assayed dispose of it to the gold refiners, who separate the precious metals by cupellation. For this purpose the residue should be dried, well mixed, and put up in tight barrels. It should then be submitted to two or more refiners, who will take samples from the barrels before making any offer for it. After the residue has been drawn off from the mill, the machinery should be stopped, and the plate, D, raised out from the hopper, by sliding up on the shaft, *b*, to the upper part of which it is to be temporarily fastened by the thumb-screw, while the gold, silver, or other metal which has been separated in the pan, C, is removed through the tap, *o*, at the bottom into a small pail, which for this purpose is to be hung upon the hook, *n*. The valuable grains are to be dried, and are now ready to be deposited at the Mint for coinage. The tap, *o*, in the bottom of the grain-separator is then to be closed by a screw-plug, which is fitted to it; the plate, D, is to be returned to its place, and the apparatus is again ready for operation the next day.

The mercury in the amalgamator requires to be removed only about once a month, or longer according to the quantity of material which has been passed through the apparatus. When sufficiently charged with gold or silver, the amalgam is to be drawn off through the cock, *i*, into the pail, P, which retains it, and allows the water to pass off into the trap. The amalgam is then strained and the solid portion distilled off to obtain the gold or silver, and the fluid mercury is to be returned to the amalgamator.

The principles involved in this invention are based on the following theory: Grains of gold, silver, or other ductile metals, when ground or crushed with quartz or other hard substances,

Fig. 2



flatten under the mill, and thus prevent the grinding surfaces from coming close enough to crush the stony matrix, or foreign substances, to a very fine powder. But if when thus crushed as fine as possible, the grains of gold or other metals thus liberated are separated, the remaining stony matters can then be ground to an impalpable powder, so that the finest particles, and even such as are invisible to the naked eye, may be liberated, and, with proper apparatus, be saved. To accomplish the separation of these finer particles effectually, the apparatus should be so constructed as to hold a large column of water, in which the earthy matters are kept constantly suspended by agitation in such a manner that while the light and heavy substances are separated from each other, by virtue of their respective gravities, the heavy metallic portions will fall to the bottom of the column, and the light and refuse earth be washed away from the surface in the current of water which constantly passes through the apparatus.

The theory presented, and upon which this apparatus is constructed, has been pronounced correct by many scientific men who have examined it. Prof. James C. Booth, melter and refiner in the Mint at Philadelphia, has examined it by the directions of Hon. J. R. Snowden, Director of the Mint, and he recommends its introduction into all our Mints. He does this in consideration of its economy of time, labor, space, and health of the workmen engaged, and because of its greater efficiency in cleaning grains of gold. We have also examined this apparatus in the Assay Office in this city, and believe it is an excellent invention. During the month of Sept. last, the gold and silver separated by it in the Assay Office this city, as certified by Clarence Morfit, assistant melter and refiner, amounted to 1,567,48 ounces. Mr. Kent has applied for patents in America, England, France, and Belgium, and more information respecting the apparatus may be obtained by letter addressed to him at 116 John St.

[Assay Office—An article describing the various operations of refining the gold in the Assay Office will be found in this number on page 86.]

Shooting Molten Iron.

Gen. L. V. Bierce, of Akron, Ohio, states that Capt. C. S. Brown, of that place, but now deceased, suggested to him ten years ago the idea of forming a shell to combine the properties of a shot and a bomb. He states he perfected the idea, and sent his specification to the War Department in Washington, describing it minutely. He says: "It consists of a hollow shot of any given caliber, with a round hole or fuse on its side; on the sides of this fuse are two parallel raised lines, grooved on the inner under sides of them, into which to slide a piece of wrought-iron to clean the fuse when the shell is filled. The inside of the shell must be coated with some substance to prevent the molten iron from coming in contact with the iron of the shell.

"A furnace inside the fort or battery would supply the molten iron. The shell can, of course, be fitted to any sized gun, and when filled with molten iron, has the weight and form of a cold ball; when it strikes a solid body it will burst, and the molten iron is a thousand times more destructive than a hot shot, and by scattering the particles of hot iron in millions of directions far exceeds the destructive qualities of the bomb. With a battery supplied with such missiles at Sweaborg, the allied fleet could never have approached it, or if they had, would have been sunk, burned, or exploded."

This invention he states "is now claimed by a British engineer, and since it has come out as a British invention, our government may probably adopt it." He accuses, we think, our government unjustly. We think such shot would not prove so destructive as a bombshell. This can be very easily tested.

The French Exposition.

One of our French correspondents, writing from Paris, states that a petition is on foot soliciting the re-opening of the great Industrial Exhibition in that city next spring. It is stated that about one half of the exhibitors have signed the request. As yet neither the Company nor the government have taken action in regard to the matter. Another petition for the continuance of the present Exhibition beyond the day of closing, Nov. 1, had but very few signers.

Large copper smelting works are about to be erected at Chicago, Ill.

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Scientific American.

NEW-YORK, NOVEMBER 24, 1855.

Tunnels and Tunnelling.

A French engineer, M. Favré, has recently proposed the construction of a tunnel under the waters of the Straits of Dover, to unite France and England, by a subterranean railway. Surveys of the route have been made; every foot of the English channel has been sounded, and recent English papers assert the practicability of the project. Its length, under water will be nineteen miles; and the entrances on land, to obtain the proper grade, will be about two miles long, making a total length of about twenty-one miles. Its walls are intended to be very thick, composed of huge granite blocks cemented together, and lined with a circular shield of perforated iron plates.

The railroad through it is intended to be operated by stationary engines, which are to drive the trains by compressed air, and thus avoid the heat and smoke, which would be entailed by the use of locomotives. In excavating this tunnel, M. Favre proposes to get rid of the excavations in a most ingenious and economical manner. The plan consists in building strong tall air shafts or chimneys for ventilation along its course, through which the excavated materials shall be lifted and thrown into the sea, forming little islands around the shafts, thus protecting them from the action of the waves. The whole cost of this great work, it is stated, will amount to but $10,000,000. In an article on this subject, in the New York *Times* of the 13th inst., we find the following remarks:—

"When Mr. Isambert Brunel projected the Thames Tunnel, people first scoffed at the feasibility of the undertaking, and then, when the great engineer demonstrated its practicability, by achieving his plan, they took to wondering of what earthly use this great expensive under-ground gallery could possibly be.

For a long time, we confess, we were rather skeptical of the practical benefit to be derived from Mr. Brunel's splendid whim. We knew that certain people sold cakes and candy by gas-light in the Thames Tunnel to wondering country people, who paid their sixpences to walk through that great damp, moldy gallery; but there it seemed as if the commercial uses of the Tunnel ended. Now we know better. The successful accomplishment of the Thames Tunnel has directed the scientific mind in that line, and the result has been that we are, in five years from this time, to have a tunnel beneath the English Channel, running from Boulogne to Dover."

The idea of tunnelling the river Thames is probably due to Ralph Dodd, a painter by trade, but an able amateur engineer, who proposed to construct a tunnel under the Thames at Gravesend, in 1798; and in 1807 Trevithick, the engineer, was employed to sink a shaft and commence a tunnel at Rotherhithe, in London, but the water and quicksand broke in upon his excavation and defeated his operations. The project was then abandoned until 1823, when a company was formed to carry out Brunel's plan, which, after some reverses, was accomplished, and the Tunnel opened in 1843—twenty years after the company was formed. This tunnel is but 400 yards in length, yet it cost, from first to last, $2,273,000, while its annual receipts only amount to about $25,000.

Another engineer, Henry Mullines, also proposes to construct a tunnel of huge iron tubes, made in sections, bolted and cemented together, and laid down in the Channel between France and England. He asserts that the bottom of the Dover Straits is suitable (it must be level for this purpose,) and that such a tunnel will be much cheaper than one which has to be excavated under the bed of the sea.

This plan looks far more feasible than the one suggested by Favre; but we have no idea that the Tunnel between France and England (eighty-three times the length of the Thames Tunnel) can be constructed for ten or twice ten million of dollars, taking the expense of the Thames Tunnel as a basis. Tunnels are the most expensive works of railroad engineering; and, like bridges, their expense increases in a quadruple ratio, according as their length is increased. This fact should not escape the attention of engineers when they enter into calculations upon enterprises of such magnitude.

Progress of Photography.

This is the general name now applied to sun painting on paper and glass, as being different from that of the daguerreotype, which is produced on metallic plates. The inventor of photographs is Fox Talbot, of England, who secured patents in Britain and America, but since then, has thrown them open to the public. Daguerreotyping spread rapidly throughout the world, and hitherto has been the most extensively practiced in our country, while photography, on the other hand, has been practiced by but few artists. This branch of the art, however, is fast rising into importance, and is destined apparently to entirely supersede the art discovered by Daguerre. In France where the daguerreotype was first discovered, the splendid display of photographs in the Great Exhibition of Industry, and the limited number of pictures on metallic plates, afford conclusive proof that, with the French artists, the daguerreotype is becoming obsolete. A very full account of preparing photographic paper, taken from F. Talbot's specification, was given on pages 368 and 376, Vol. 3, SCIENTIFIC AMERICAN. Since that period a most valuable improvement has been made in this branch of sun painting, by taking the pictures on prepared glass, as described on page 347, Vol. 5, SCIENTIFIC AMERICAN. This invention has been attributed to M. Evrard, of Lille, France, but the real inventor is now, we believe, ascertained to be M. Niepce de St. Victor, an officer and *chef-de-battaillon* in the French service, *Commandant* of the Louvre, and nephew of Nicephone Niepce, the real discoverer of the daguerreotype. After long and persevering efforts and endless disappointments, he hit upon the albuminated process. The glass is covered with a thin coating of albumen, or white of eggs; in this albuminated state it is plunged, when dry, into a solution of nitrate of silver, by which the incrustation of albumen is at once hardened and rendered sensible, in a high degree, to the rays of light. In this way negative pictures of great beauty are obtained.

The next discovery in this art consisted of the substitution of collodion for albumen, which was discovered by Mr. Archer, of London, in 1851, as described on page 210, Vol. 10, SCIENTIFIC AMERICAN. The collodion used consists of gun cotton dissolved in ether, and mixed with the iodide of potassium. The qualities of the the two processes are thus distinguished. Albumen is somewhat difficult of application with evenness and exactitude on the surface of the glass; its sensibility is not great enough to secure rapidity, the process occupying a space of time varying from a few minutes to half an hour, according to circumstances, but never being instantaneous. Its advantages, on the other hand, are, that when once applied to the glass, it may be carried about (always, of course, guarded from the light,) and used even a month after, with equal efficacy. On the contrary, collodion is of the easiest application, and its sensibility is so great that the process may be said to be, in fact, instantaneous—can catch the smile ere it fades upon the lips, or arrest the passing cloud as it floats along the air. But the preparation of the glass must in general take place upon the spot itself where it is to be used; and, as a general rule, is hardly available an hour afterwards.

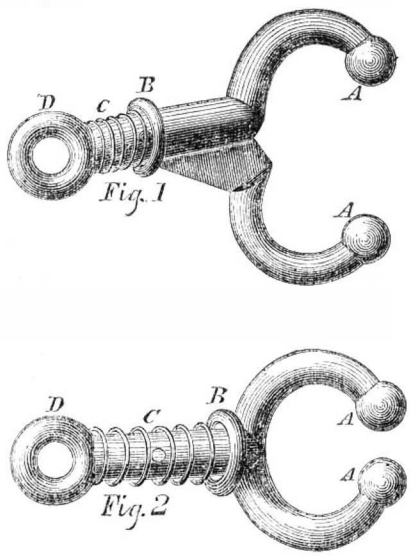
We have recently noticed that photographs on paper and glass are becoming more common in New York, and very fine portraits are now produced by some of our artists, but the price of these is very high in comparison with daguerreotypes; for what reason we cannot tell. That photographs can be executed as cheap as pictures on metal plates, we cannot doubt for a moment, and we yet hope to see the finest placed within the reach of every mechanic.

There is one branch of photography to which we would wish to direct the attention of our artists, viz.: landscape sun painting. The French photographic artists have become eminently distinguished for their landscape photographs; these formed the chief and crowning glories of the art in the Palace of Industry; some of them, indeed, rivalled fine oil paintings. The French artists are now busied taking pictures in every corner of France, architectural, monumental, archæological and picturesque; spreading themselves, too, all over Europe, and bringing back with them the snowy mountains, the lakes and valleys of Switzerland, and the monumental riches of the Italian cities. Every science is largely profiting by the ever-enlarging field of this wonderful process. Geology, anatomy, botany, are supplied with copies such as no human hand can draw; and it can catch the sunbeam on the mountain, and the waters of river and stream. We have noble scenery in this our great American land; what fields for our photographists, to show their skill and daring. Hitherto, however, they have shown themselves to be but "carpet knights."

We have heard nothing lately of the Hillotype; that name given to the taking of the colors as well as the form of natural objects, said to be discovered by the Rev. Mr. Hill. Reports of this discovery created no little excitement among our artists a few years ago. M. N. de St. Victor, of Paris, we know is still in pursuit of solving the secret of producing the natural colors in the *camera obscura*, and he has obtained them, but the power of fixing them permanently is yet sought for; at present they are made to appear upon the paper, but gradually fade away, and disappear under the continued action of the light and air.

That he, or some other artist will produce these colors permanently, we cannot doubt, and we hope that this discovery is not far off.

Clasp for Leading Cattle.



The accompanying figure represents a Clasp for leading cattle, for which a patent was granted to Joseph Welton, of Waterbury, Conn., on the 20th of Sept. last.

Fig. 1 is a view of the clasp open, and fig. 2 a view of it shut. It is composed of two parts, and is spread out, as shown in fig. 1, to be inserted in the nose of an animal, and fig. 2 shows the position of the clasp, when it is used in leading an animal. The two balls, A A, are placed in the animal's nostrils, and are held in place by a slide, B, which is kept pressed down by the spiral spring, C. A rope is attached to ring, D, and by it the animal is led. The claim is not for leading cattle by a ring clasp, but for the clasp as constructed, combined with the spring, C, and slide, B. It appears to be a good clasp, quite superior to the common rings used for the same purpose.

More information respecting it may be obtained by letter addressed to the patentee, at Waterbury.

Railroad Train Blown off the Track.

A singular and unfortunate accident took place on the Harlem Railroad, near Chatham-Four-Corners, on the morning of the 12th inst. While the train was running on an embankment across a narrow valley, between two mountains, the wind came up with a terrific gust, lifted the cars off the track, and hurled them down the embankment—40 feet deep. Two of the passengers were killed instantly, and sixteen wounded. The cars were smashed to pieces, and it is a wonder that any person on board escaped with life. It is the first railroad train we ever heard of being thrown from the track by the force of the wind. The strength of the gale in that mountain gulley, to do this, must have been extraordinary, but not more so than the blowing down of houses, and the tearing to pieces of huge trees by tornadoes. The gust which caused the unfortunate accident was probably a whirlwind, formed by the junction of two currents at some angle of the mountains.

Fair of the American Institute.—Award of Prizes.

We expected this week to have published a list of the awards at the late Crystal Palace Fair, but are compelled to defer it until our next issue. One of the city daily papers attempted to publish the names of the successful exhibitors last week, but that list was so full of errors as to be wholly worthless. We have endeavored, at times, during the week, to obtain access to the official list at the Institute; owing, however, to the confusion consequent upon the closing of the Fair, and the disconnected, incomplete arrangement of the names, we have been unable to do so. We only propose to publish the awards to inventors and exhibitors of novelties; but we are determined that whatever we do print shall be correct and reliable.

Those who have had charge of the preparation and arrangement of the premium lists, appear to have done themselves little credit. They should have had several duplicate certified copies of the awards ready prepared for the public press, to be handed out the moment the reading began. Instead of this they have suffered a sort of burlesque detail to be printed, greatly to the injury of the exhibitors. In justice to the latter, the Institute should immediately prepare and publish, at their own expense, a full and correct statement of the premiums. The American Institute ought to know, by this time, how to manage such business properly.

The following notices of articles exhibited at the Fair, were omitted last week:—

Gas Regulators.

Hoard's invention consists of a small round metallic box, resembling, externally, an inkstand. Internally it contains a simple arrangement of self-balancing valves. The gas from the street pipe is conducted into it on one side, and discharged on the other into the meter; the regulator being thus placed between the supply and the meter, all the gas, before it is consumed, must pass through the regulator. The maximum pressure for the economical burning of gas is six-tenths of an inch; the street pressure is generally greater than this, and there is consequently an escape of gas without increased light; this escape is imperceptible to the eye, but it nevertheless really exists, and causes a serious loss to the consumer. Hoard's gas regulator is intended to check the increased pressure, and to deliver the gas properly at the burners. Those who wish to diminish their gas bills 25 per cent. or more, can probably do so by using this improvement; we have seen many testimonials, and we have tried the invention on our own premises long enough to satisfy ourselves that it effects a great saving. J. W. Hoard, exhibitor, 406 Broadway, N. Y. Patented 1855.—First exhibition.

Kidder's invention presents the same general appearances as Hoard's, and is used for the same purpose. The owners of Kidder's patent claim that it saves from 25 to 60 per cent. of the gas. There is no doubt of its economy. Price for smallest size, $13,50. Exhibited by the N. Y. Gas Regulator Company, J. L. Douglass, Secretary, 262 Broadway, N. Y.

Kelly's Weighing Apparatus.

In our notice of this invention we gave the name of the inventor as Mr. John Kelly, of Sag Harbor, L. I. It should have been James Kelly. This gentleman is the originator of many new and ingenious improvements; it is but proper, therefore, that his cognomen should stand right before the public.

Races at Agricultural Fairs.

Female races have become quite common at most of our agricultural fairs. We cannot divine to what branch of agricultural improvements such feats should be assigned. We believe they are inappropriate and out of place.

If any of our subscribers have Numbers 25, 26, 28, and 50 of Vol. 10, that they do not want, we should be glad to get them. We are entirely out of these numbers.

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Impure City Water.

During 1854, the good people of Boston were sadly afflicted for about three months with the peculiar fishy taste of Lake Cochituate (hard name) water, and eminent chemists were appointed to discover the cause of the evil. Those chemists—Dr. Jackson and Prof. Horsford—attributed the foul taste of the water principally to vegetable decomposition, during a severe drouth, when the supply of water was greatly reduced. Dr. Hays discovered afterwards that the principal source of the taste and odor of the water was a great increase of animalculæ. The main cause of the evil, however, was generally conceded to be the long drouth in 1854, whereby the usual supply of fresh water to the Lake was suspended for a long period.

During the present summer, the good people of Albany, N. Y., who are also supplied with water by gravitation, were afflicted with their water having the same fishy taste as that of Boston, and they appointed a committee consisting of Thos. McElroy, H. Gilbert, and H. J. Wells, to institute measures to discover the cause. These gentlemen have made a report of their labors, which do not appear to have been very extended or severe. No scientific gentlemen were appointed to analyze the water, although there are some good analytical chemists in that city, but they were content with taking up the report of Prof. Horsford on the Boston water, and George W. Carpenter, C. E., Superintendent of the Water Works, and making some comments on them. This gentleman attributes the offensive taste of the Albany water to the seeds of a certain grass growing on the banks of Rensselaer Lake (the main reservoir,) the margin of which was covered for several feet with water this season, owing to the unusual quantity of rain which fell. Dry weather was stated to have produced the evil in Boston in 1854, while too much rain is stated to have caused it at Albany in 1855. Both of these opinions as to the causes of the bad taste of these waters may be correct. The question then arises, "how may such an evil or evils be remedied?" The Albany committee has given a very sensible opinion on this very point, and as it is a question of scientific and sanatory importance, all cities and villages supplied by public water works should know what it is. The report of the committee states that "a fact elicited at Boston was the tendency of the impure water to settle to the bottom, and this goes to show the importance of taking the supply invariably from near the surface." It then condemns, and justly, we think, the drawing off water from the reservoirs near the bottom, as has been done by the Albany water commissioners. The report also mentions another feature for preserving the water from becoming impure, namely, to keep up a constant circulation of the waters in the reservoirs. Large collecting sources of water supply, like Lake Cochituate and Rensselaer Lake, basking in the hot summer sun for weeks, must become stagnant, and ferment, for want of motion—circulation—because the quantity daily drawn off is but small in proportion to that in these reservoirs. To remedy this evil for Albany, where the water supply is equal to 2 1-2 millions of gallons daily to 50,000 inhabitants, they propose to reduce the quantity in the main reservoir, so as to expose the water but a short time to solar action. This may do very well for that city, but the most sure and certain remedy, we think, is to have a great number of small reservoirs, through which the water drawn off daily shall flow in a smart current, instead of having a few large reservoirs, the water of which must have but a sluggish motion, owing to the small amount daily drawn off, in proportion to the stored up supply. These views, we believe, are of great importance to all cities supplied with water by gravitation.

Railroad Economy—Prizes.

On the first day of October the Superintendent of the Boston and Montreal Railroad offered premiums to the engineers upon the road as follows:

"Each engineer on passenger trains who runs 25 miles to a pint of oil, and ordinary repairs within three cents a mile, is entitled to $2 per month extra pay.

"Each engineer on freight trains who runs 20 miles to the pint, and repairs within 3 1-2 cents, is entitled to the same pay. New wheels or tyres not reckoned in repairs.

"The engineer who handles his engine best in the above particulars, a gratuity of $20, and to the next best a gratuity of $10.

"Gravel trains to reckon the same as freight.

"One dollar per month extra to each engineer who will gain five miles to the pint, and reduce one half cent on repairs from the above limit. Running five miles to the pint *below* the above limit, will be considered as unskillful management."

The spirit of emulation thus incited has effected a large saving in the running expenses of the engines. The result for the month of October has been figured up, and it has been found that the retrenchment has been as follows, compared with the corresponding period of last year: 460 gallons of oil, $1 30 per gallon, $605 80; repairs, $1779 79. Total, $2385 59. The premiums paid amounted to $56 only.

Curious Property of Water Divested of Air—Boiler Explosions.

In a lecture recently delivered before the Royal Cornwall Polytechnic Society, by Robert Hunt, F. R. S., attention was directed to some most remarkable points in connection with the action of heat on water that contains no air, stating that, arising from this circumstance, as well as from the spheroidal condition of the steam generated, we have two very active and predisposing causes of boiler explosions. Water we know in three conditions—as a fluid, as steam, and as ice—or as solid, liquid, and aeriform. Water is frozen by the loss of heat necessary to maintain its fluid state; ice formed during agitation contains no air-bubbles, but, under ordinary circumstances (as Wenham Lake ice,) the upper portion is filled with air-bubbles in straight lines, as if, in endeavoring to make their escape, they became entangled among the crystals. It is a remarkable fact that water in the process of congelation has the power of rejecting everything; consequently, all the air the water contains is expressed. If we get water which contains no air, and prevent the access of air to it, it will not boil at 212° Fah. In this state, we see the temperature increasing to 230°, 240°, or even 250°, and advancing to between 270° and 280° about these points the whole mass will explode with the violence of gunpowder. This condition of water is not unfrequently found formed in steam boilers, and that, during the process of ebullition, the steam carries off with it the air, the water in the boiler containing very little remnant of the air itself. It often happens that a steam boiler explosion occurs after a rest of the engine, and that, when the men return, the feed-water being applied to the water, explosion takes place. Professor Donne has found that, if we take water of this peculiar character, bringing it up to 230°, and place a single drop of ordinary water into it, the whole will boil with extreme violence. Supposing that ordinary water contains no air, and the feed-water is turned on, the entire quantity will then burst into explosive ebullition. We shall probably find, therefore, in connection with boiler explosions, that to the absence of air may be attributed many boiler explosions so frequently happening, which otherwise cannot possibly be accounted for.—Itmay be further stated that if we take a glass of water, and add any poison—say corrosive sublimate, or a strong acid, or even an ardent spirit—and then freeze the water, agitated during the process, we shall find the ice get tasteless, colourless, and inert. and that the poison, the acid, or the spirit, will be gathered into an intense drop in the center of the ice, and all the body will be perfectly pure. To a knowledge of this fact may be attributed the practice of the Russian nobles, who, when they desired to have more ardent and intoxicating drink than usual, plunged their bottles of wine or spirits into their frozen rivers, until the contents became solidified, and then drank the ardent drop which remained within the center of the glass.

Medical Virtues of Parsley.

Two physicians of Paris have published a memoir, the object of which is to make known the immense resources which the healing art may draw from the seed of parsley. This common indigenous plant possesses incontestible febrifuge qualities or properties; the decoction of its seed may be substituted for that of cinchona, and the active principle which has been drawn from it, and which they designate under the name of apiol, is equivalent to quinine in the treatment of the local intermittent fevers.

The Assay Office.

All the melting and refining operations of the United States Assay Office, in Wall Street, this city, are under the superintendence of E. N. Kent. When he entered upon his duties as melter and refiner, the old expensive and troublesome method in use of recovering gold from earthy matters and sweepings, incited him to invent something better, and this excellent apparatus is an evidence of success in his study and labors in that line. On a visit to the Assay Office, last week, we saw it operate, and were pleased with its simplicity of construction and the principles of its action. It has effected a great saving since it was put in operation.

The Assay Office is adjacent to the Custom House in Wall st., and in it the operations of refining the golden products of California are conducted on an extensive scale. The gold, in parcels, is brought by depositors into the receiving office, where it is weighed, carefully examined, each lot marked, and certificates given. From this office, all the gold is taken to the deposit melting furnace in another apartment, and is there melted in separate parcels in crucibles, then run into cast-iron molds and stamped. It is a curiosity to see the stalwart melters handling red-hot ingots of gold, with thick felt gloves, as calmly as masons handle bricks. These molded ingots of five thousand dollars each, are then weighed again, and registered. This gold is now fit to be granulated with silver, to prepare it for the refining operation. It is now taken and mixed with twice its weight of silver, melted in proper furnaces in crucibles, and poured out in a molten state into vessels containing water which, when it comes in contact, spreads it out like feathers. This operation is called "granulating," and sometimes "feathering." It gives the metal an immense amount of surface, and eminently fits it to be acted upon by the parting agent—nitric acid. The granulated metal is now taken to another room, and placed in large stoneware vessels containing the acid. These are kept in a large close chamber, and are heated with steam. A dense, noxious, yellow vapor arises from the action of the acid on the metal, and is carried off into the atmosphere through a very high chimney. Nitric acid will not dissolve gold, but it dissolves the silver of the granulated metal, taking it up in a clear solution, while the pure gold sinks to the bottom of the vessel in the state of a brown powder. When all the gold is thus separated, the clear solution—nitrate of silver—is run off into a large vat in the room below, and the gold powder is placed in wooden tubs, where it is washed with water until the washings will not afford a white cloudy precipitate with a simple solution of common salt in a test glass. The washings containing the most minute traces of nitrate of silver are saved, and run into the vats below. The washed gold powder is now dripped and carried to a Bramah press, when it is submitted to a severe pressure—like a cheese—in a metal ring box. After this, all the moisture is expelled from it in ovens—the invention of Mr. Kent. From these it is taken to furnaces, melted in crucibles, run into ingots or bars, then placed—all hot—for a few seconds in a "brightening" bath of dilute sulphuric acid, taken out, washed, and is now finished refined gold. After this, a small bit of every parcel is taken to the Assayer's room, where it is submitted to the *experimentum crucis* of a very refined analysis, to determine its fineness. It is then weighed, stamped with its weight, fineness, and value, and is then ready to be sent to the Mint to be struck into coin for circulation, or shipped abroad to pay our foreign debts.

It requires twice as much silver in the Assay Office as the gold to be operated upon. This silver is reduced to a nitrate—as has been described—then it is precipitated in large vats in the state of a white powder—the chloride of silver—by a solution of common salt. The nitric acid unites with the soda of the salt, and the chlorine of the salt unites with the silver. The nitrate of soda is then washed away, and the chloride of silver is precipitated in other vessels into a pure silver powder, by granulated zinc. The zinc unites with the chlorine, forming the chloride of zinc, leaving the silver in the state of a pure powder. The chloride of zinc is then washed away, and the silver powder is submitted to hydraulic pressure in the Bramah press, and again brought into the metallic state, and used over and over again, *ad infinitum*, for the same purposes, thus exhibiting the triumphs of chemistry in a simple and remarkable manner. All these operations are conducted with the most scrupulous care, and are managed with profound skill.

Considerable machinery is employed in the Assay Office. This is driven by a compact double cylinder direct-acting engine, made by Starbuck & Sons, of Troy, N. Y. Three steam boilers are employed to raise steam for the engine, and to heat the acid baths and water required for the various washings. All the sweepings of the floors, &c., are preserved, and the old crucibles, ashes, and other refuse matters are ground up, and the gold separated by Mr. Kent's apparatus. All the gold which arrives in New York from California is refined in this Assay Office; this amounts to about thirty millions per annum. The depositors of gold receive warrants for it, payable as soon as its value is determined—this is done in the course of one or two days after it is deposited.

A New Leyden Jar.

At the Gutta Percha Works in the City road, London, about 50 miles in length of copper wire had to be covered in with gutta percha for a submarine telegraph. For trying whether the wire was thoroughly insulated and covered, the practice is to lay it in a large coil, put it into water, and then pass the electric current through it. On one occasion, the man who held one end of the wire stood carelessly near the tank, with his hand over the tube, and on contact with the water, he received an electric shock, so violent as to knock him senseless to the ground. Edwin Clark, the engineer to the company, could scarcely understand the circumstance, and the attention of Prof. Faraday was drawn to the subject. It was found that they had formed thus accidentally, as it were, an enormous Leyden jar, which usually consists of a glass jar, with tinfoil in the inside as well as the outside; the inside is charged with the electric element, and the outside not so. The two pieces of metal being in dissimilar conditions, a connection is made between the two, and a restoration of the equilibrium of the electric forces follows, the result of which is the electric spark. Now, in this instance there was presented the copper wire, which represented the inside of the Leyden jar; the gutta percha stood for the insulating glass of the jar, and the water formed the outside coating, consequently there was at once constructed a gigantic Leyden jar, produced by galvanic electricity, from which the shock rose, through which the man who supported the end of the wire was knocked prostrate. Upon this idea Runcorfe contrived a coil carefully insulated by gutta percha and by glass pillars, so as to prevent escape, and thus obtain the most beautiful manifestations of machine electricity which can possibly be imagined. Thus it is that galvanic electricity is converted into "Franklinic" or lightning electricity, of greater power than by any other means. It had long been desired to determine, with the greatest possible accuracy, the connection which exists between a galvanic current and the ordinary electricity from an electric machine. The differences appear to be very striking. A spark is struck from the Leyden jar, and all is over, but a current from a voltaic battery is a steady flowing stream, a uniform disturbance being occasioned through any length of wire, as in the electric telegraph. It has always been thought that these two conditions of electricity were the same, but differing in degree. The great discovery of their intimate connection is due to the somewhat curious accident referred to. Most of the discoveries in electricity seem to have come to light by accident, like this one; to this assertion we must always except the beautiful experiment of Franklin with his kite.

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TO CORRESPONDENTS.

G. S., of Me.—In Volume 7, we published an engraving of Usher's steam plow. It has not been heard of since.—It is a desideratum, surely, to produce a steam plow capable of operating well, as there is considerable demand for a good machine of the kind. Your plan does not embrace any patentable feature. You are wrong in supposing that no efforts have been made in this direction in this country. Several applications have been made for patents on steam plows, but as yet no attempts have been fully successful in introducing them.

H. H., of Pa.—There is a positive law in regard to recording assignments within a specified period. Every assignment should be recorded within three months rom its date; but if recorded after that time, it will protect the assignee against any one purchasing after the assignment is placed on record. You had better have yours attended to at once.

G. H., of ——.—The sketch of your excavating machine we have carefully examined, and it seems to us to possess novelty of a patentable character. We should have written you a letter, stating particulars, but you failed to furnish us with your address. This is very careless, and is a neglect often chargeable to our correspondents. $5 received.

R. R., of Vt.—Your alleged improvement in continuous rail embraces, in our opinion, novelty upon which a patent can be secured. Some of the best plans of rails we have ever seen could not be brought into use owing to the difficulty in getting them rolled. This is important in your case, and we would recommend you to consult with a practical man on the subject. We can see no objection to it.

D. McC., of Pa.—We are of the opinion that Flanders patent of 1853. for raising cars upon the track, covers all the essential features found in yours. We believe the improvement has been successfully tried.

I. W., of N. Y.—We do not know of any class of inventions, at the present day, more difficult to secure by patent than attempts to improve the water wheel. If you will take the back volumes of the Sci. Am., you will find that very few patents have been issued on water wheels for eight years past. Your ideas appear to be new, and we should think you had better embody them in a model, and forward it to us for examination. t is possible that a claim may be secured.

C. B., of Ind.—We have made *several* applications for patents on marble saws, none of which embraced your device for operating and expanding the saws. We think a claim on the feature could be secured.

M. H., of Md.—Your letter written in pencil is received, and the flour packer has been examined. We think it is new, sufficiently so to warrant an application for a patent. When you write to us again, please drop the pencil and take up the pen. We shall like your communications much better for being written in ink.

L. S. S., of Conn.—We cannot see how you can gain anything by changing your wheel.

G. W. M., of Vt.—We cannot tell why one end of your main shaft gets heated, while the other keeps cool. There is no doubt a cause for it; you must search it out.

W. H., of N. Y.—You state that unseasoned mahogany logs, which are heavier than water, will sink, but at Porto Rico they are made to float by simply driving an iron spike in the end of each. This you say, was told you by a gentleman from that place, and you wish to have this fact accounted for by us on the principles of science. We first want the fact established, for we do not believe it is so, and afterwards we will hunt for the science.

W. K., of Ind.—No patent could be procured for stone or earthen coffins: they were among the earliest devices employed for entombing the dead.

G. S. S., of Mass.—It would be an important advantage in lighting a city, to increase the illuminating power without an increase of the expense. An invention of this character would not be objectionable for any place.

K. & L., of Mo.—Grate bars, made hollow, for allowing a current of cold water to pass through for protecting them from burning out rapidly, are not new. In Vol. 3, Sci. Am., you will find an illustration of the same device. It has often been submitted to us.

J. L, A., of R. I.—The Fair of the American Institute closed on the 13th inst., and we presume that no machinery is now running there, as most of the exhibitors were very glad, no doubt, to get away. The Woodworth Patent xpires in December, 1856. See our remarks on the subject in Nos. 8 and 9. Cases are now ordinarily about two months in the Patent Office, and sometimes a little longer. Since Judge Mason's return matters are going on with much more vigor in the Office.

S. W., of N. H.—Your adjustable device for supporting table leaves has been carefully examined, and we think it possesses novelty of a patentable character. The advantage of being able to open the leaves with one hand, while holding something in the other, is important, especially when the housekeeper is in a hurry to serve up lunch. The "squeaking" noise you speak of that attends the turning of the supporting lever underneath, is rasping to the nerves, and ought to be obviated. Your device does this up fully, we should think.

N. A. & Bro., of Del.—Endless chain cutters for reaping machines are not new. W. F. Ketchum, of Buffalo, N. Y., patented this device in 1847, but has never brought it into use to any extent. It is understood to be much inferior to the reciprocating knife commonly used. You have no encouragement to apply for a patent on your plan.

A. K. S., of Pa.—A large plate representing the American condensing steam engine in detail, accompanied with an explanatory book of reference, was published about four years ago by F. Cook, of this city, and we kept them for sale. A limited number only were published, and they were soon exhausted. We have not had one for sale for three years.

R, F. D., of Ct.—All business entrusted to our care is strictly confidential. Your sketches are duly filed away, and will be carefully preserved, until your application is complete.

C. C., of Ct.—You will find the address of the knitting machine agent in the last issue of the Sci. Am.

S. M. P., of N. Y.—In answer to your letter, we would state that caveat papers cannot be withrawn from the Office after they are filed. In completing an application for a patent, additions may be made to the model. This is contemplated under the patent system, and if you do not find yourself able to complete the application in January, the fee of $20 can be applied any time thereafter. Your right to use the money on an application for a patent on the machine which you caveated, is without limit, but you could not apply it towards the fees on any other application.

S. S., of Pa.—We are informed that Louis B. Bryan, of Limerick Bridge, Pa., manufactures Polley's Patent Bucket. You can address him upon the subject.

B. G. H., of N. Y.—In Vol. 9, page 410, Sci. Am., we published an engraving of a rotary plow. Such plows are well known in England and have been used with some success for pulverizing light soils. We have had several different plans submitted to us within the past three years.

J. H. S., of N. S.—You will find all the information we can give you on the latest improvements on the rotary engine, in the last two volumes of the Sci. Am.

M. N., of N.Y.—Your sketch of a bowl of water and floating stick does not demonstrate that a body like a hollow ball placed in mercury loses weight—becomes lighter,

J. Van H., of N. J,—Corn husks have been proposed to us a number of times. for making paper, and we have seen some good samples made from them, but it cannot be made so cheap as from rags.

H. A. L., of N. J.—Yours will meet with attention.

J. F. M., of Phila.—Your communication on photographs and stereoscopic angles has been received.

J. H., of Pa.—We cannot tell where you can get a work on the making of patterns for cog wheels.

B. G. N., of Wis.—Alcohol should preserve gum mucilage from fermenting.

J. L. D., of Ga.—Yours has been received, and will meet with attention.

C. H. D., of Vt.—The sketch of your machine for dressing carriage fellies has been examined. The operation of the machine is not described, therefore we do not fully understand the difference between it and Adams' patent. We think you had better construct and send us a model of it, and then we can fully understand how it operates. If the cutters rotate over a stationary bed upon which the timber is fastened, it is not new.

C. C., of Pa.—If you file a caveat on an invention, and afterwards some one publishes an engraving or notice of it, it will not affect your right to a patent if your invention proves on examination that it was new at the time your caveat was filed.

H. G. R., of Tenn.—The sketch and description of your alleged improvement in reaping machines have been examined. In its general construction it differs from any other with which we are acquainted. It does not appear so simple in its arrangement as those in general use, and we should think it unhandy to navigate, as it is not so compact as others. If we are not correct, we think you would succeed with it.

Thos. Bell, of Louisville, Ky.—Wishes to procure the best veneer sawing machine in use.

R. H. McC., of Pa.—Before we can give you any information about your invention we shall require a sketch and description of it. Inventors should always bear this advice in mind.

J. A. R,, of Miss.—We do not see how we can render you the slightest service in your gigantic enterprise. We are not operators in that line.

E. P., of Pa.—The sketch of your alleged improvement in water wheels has been carefully examined. Admitting the water into an orifice in the center and discharging it at the periphery of the wheel, is not new or patentable. It has often been done.

W. B. G., of N. Y.—India rubber has been used for boot and shoe soles for a number of years. Its application to boot heels could not be patented.

Money received at the Scientific American Office on account of Patent Office business for the week ending Saturday, Nov. 17, 1855:—

C. J. C., of Pa., $25; J. A. A.. of Ct., 10; J. L. & S., of Ill., $30; R. P. W., of N. Y., $30; J. P., of N. C., $100; H. N. B., of N. Y., $50; C. W., of N. Y., $150; J. P. G., of Ill., $25; J. C. P., of O., $30; R. W. & D. D., of O., $125; W. C., of Mass., $25; W. H. B., of Pa., $30; J. S., of Ct., $30; J. L. H., of Ill., $25; J. B., of Ct., $20; C. P., of Mich., $30; C. L., of Cala., $55; J. E., of Ga., $30; J. P. C., and others, of N. Y., $25; J. P. S., of Texas, $30; I. C., of N. Y., $30; C. H. B., of Mass., $25; D. L., of N., Y., $30; D. & O'G., of N. Y., $20; B. F. McC., of N. Y., $85; G. E., of Wis., $25; E. H., of O., $25; P. C. G., of O., $60; B. T. B., of R. I., $33; J. N. P., of Mass., $35; H. & T. B., of N. Y., $30; A. S., of N. J., $25; E. W., of N. Y., $50.

Specifications and drawings belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Saturday, Nov. 17:—

J. P. G., of Ill.; A. M. G., of N. Y.; C. J. C., of Pa.; J. L. H., of Ill.; J. B., of Ct.; H. N. B., of N. Y.; J. F. H., of Pa.; B. K., of N. J.; M. C., of Mass.; W. H. M., of N. Y.; H. P., of N. Y.; C. C. W., of N. Y., C. & H., of R. I.; A. S., of N. J.; J. B., of R. I.; E. H., of O.; B. F. McC., of N. Y. (2 cases); C. H. B., of Mass.; J. P. C., & others, of N. Y.; E. W., of N. Y.; S. B. W., of O.

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Literary Notices.

Westminster Review—The Number of this able Review for this quarter, contains an article on "Drunkenness not curable by Legislation," following up, as it were, an article in the last number on "Alcohol and its nature," which has stirred up a great amount of controversy. The leading article is on "Theism," being a review of Prof. Tulloch's Essay on the Witness of Reason of Revelation. This Review is what is called "liberal" in its tendencies, which is another name for infidelity. It displays, however, great ability and boldness. Published by Leonard Scott, & Co., No. 54 Gold st., this city,

Coach Maker's Magazine.—The number of this Magazine for this month contains three lithographic plates containing seven figures, illustrating a coach, a buggy, a cutter, a wagon, and Smith & McNaught's improvement on what is named "Murgartroyd suspension buggy." It is also illustrated with several wood engravings, representing different kinds of new vehicles.—It is a good number. C. W. Saladee, Editor and Proprietor, Columbus, Ohio.

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Private consultations respecting the patentability of inventions are held free of charge, with inventors, at our office, from 9 A. M., until 4 P. M. Parties residing at a distance are informed that it is generally unnecessary for them to incur the expense of attending in person, as all the steps necessary to secure a patent can be arranged by letter. A rough sketch and description of the improvement should be first forwarded, which we will examine and give an opinion as to patentability, without charge. Models and fees can be sent with safety from any part of the country by express. In this respect New York is more accessible than any other city in our country.

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In addition to the advantages which the long experience and great success of our firm in obtaining patents present to inventors, they are informed that all inventions patented through our establishment, are noticed, *at the proper time*, in the Scientific American. This paper is read by not less than 100,000 persons every week, and enjoys a very wide spread and substantial influence.

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P. N. FITZGERALD, Counsellor at Law—late Principal Examiner in the U. S. Patent Office—has removed from Washington, D. C. to the city of New York, 271 Broadway, (corner of Chambers St.) As heretofore, his practice is confined to Patent Cases, which he will prosecute or defend, as counsel, before the Supreme and Circuit Courts of the United States, also before the Patent Office, or the Judges having jurisdiction of appeals therefrom. 11tf

DYOTT'S PATENT IRON FRONT.—Dyott's Patent Furnace; Ludwig's Patent Machine for Felling Trees; (refer to Sci. Am., Sept. 8, 1855, No. 52,) Harrison's Patent Grain Mills. For all the above, information can be had of GEO. C. BARNEY, Agent, 15 Kilby St., Boston. 11 4*

BARNEY'S PATENT WHIFFLETREE for detaching horses from vehicles in an instant of time, should they attempt to run or become otherwise unmanageable. Rights for States, counties, cities, or towns for sale very low. Persons wishing to purchase will please address, GEO. C. BARNEY, Patentee, 15 Kilby St., Boston. 11 4*

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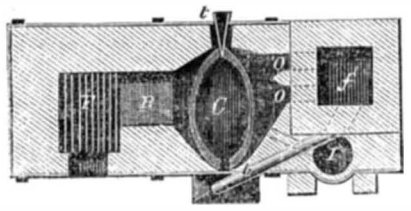
Science and Art.

Extracting Silver from Lead.

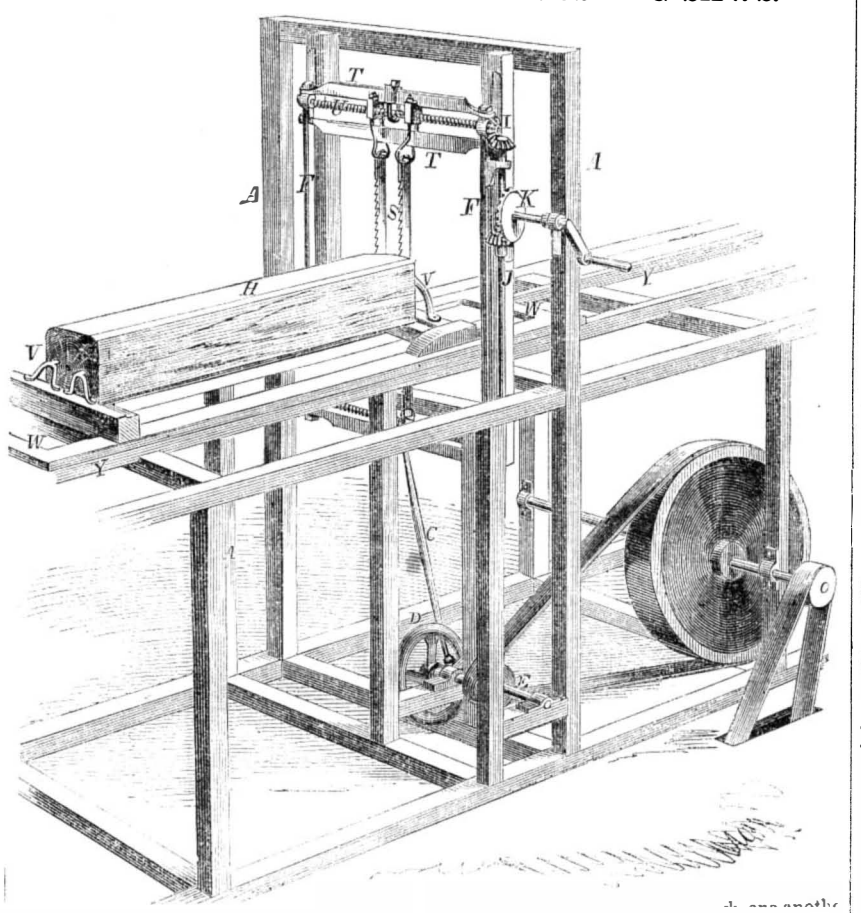
A few years since H. L. Pattinson, of England, made a very important improvement in smelting silver-lead ores which has now become somewhat common in Britain, by which ores containing no more than three ounces of silver to the tun may be advantageously operated upon; whereas, by the old method of cupelling, from the beginning to the end of the process, it required 10 ounces of silver to the tun in lead to render it profitable in working. By the old method the lead was exposed to the action of heat and air in shallow earthen dishes, the lead becoming oxydized and converted into litharge, while the silver, resisting the oxydizing influence of the air, was left pure. The new method of separating the silver from the lead more economically, still, combines part of the old process—the finishing—but the preparatory process—the discovery of Mr. Pattinson—is entirely different, and is a very beautiful scientific operation. It is founded on the property which fused lead has of becoming solid or crystallizing at a lower temperature than silver, so that if a quantity of argentiferous galena be reduced to the liquid state and then allowed to cool, solid crystals of nearly pure lead will first be formed; these can be separated by means of an iron strainer, and in proportion as this is done, the liquid mass left behind becomes richer and richer in silver. The operation is conducted in hemispherical cast-iron pans,each holding about 3 tuns of metal, and heated by a fire below. The process is repeated for 3 or 4 times for each charge; and the rich silver is finally purified from lead by cupellation.



This description of the process will be readily understood, and, perhaps, it may be profitably carried out with some of our lead ores, which are found in great abundance, in Illinois and Wisconsin especially.

The accompanying figure is a section of the refinery, where the concentrated silver and lead heated by Pattinson's process is purified. F is the fire-place, B the fire-bridge; the flame and heated air pass directly over the surface of the cupel, C, and thence escape through the two openings, *o o*, into the flue, *f*, which is connected with the main chimney. There is a small hood and chimney shown at *b*, for carrying off the injurious fumes of lead generated during the operation. The cupel or test is an oval iron frame, of which the greater diameter is 4 feet, and the lesser 2 1-2 feet; it is surrounded by a ring 4 inches deep, and strengthened by cross bars. It is filled with finely powdered bone-ash, slightly moistened with a weak solution of pearlash, which helps to give consistency to the bone-ash when heated. The bone-ash is well beaten down with iron rammers, and when the ring has been well filled the center is scooped out with a small trowel, leaving a raised border of bone-ash all round, in the figure; at the fore part or breast, the width of this border is 5 inches, and at this point a hole is cut for the escape of the fluid litharge. When the cupel is properly prepared it is lifted into the refinery and wedged to its proper hight against a fixed iron ring or compass-bar. The heat is applied with great caution, to prevent the test from splitting, and as soon as it is perfectly dry it is raised to a cherry-red heat, and filled through a spout with the rich lead previously fused in the cast-iron pot, I, which has a small fire beneath it. The lead soon becomes covered with a grayish dross, but on increasing the heat, a covering of litharge begins to form. The blowing apparatus is now set in motion, and the blast from the tuyer, *t*, drives the litharge from the back of the cupel up to the breast and over the gateway when it falls through the hole in the cupel into an iron pot below. The blast not only sweeps off the litharge from the surface of the lead, but supplies the oxygen required for its formation. As the lead wastes away by the removal of the litharge, more metal is added from the melting-up,and the process is continued until about 5 tuns of rich lead have been poured into the test. When this has taken place the whole of the silver is left in the cupel in combination with only 2 or 3 cwt. of lead. This is now drawn off and another charge introduced, and when a sufficient weight of this rich lead has been collected to yield a cake of silver of from 3,000 to 5,000 ounces, the lead is again melted down, placed in a cupel, and the pure silver extracted. The test used for this purpose is so hollowed out as to produce a thick plate of silver, and allow space for the removal of the slags around its edges at the completion of the operation. The moment when the oxydation of the lead ceases, and when, consequently the cupellation is finished, is marked by a peculiar appearance called the "lightening." During the whole period of oxydation the metallic bath appears more brilliant than the walls of the furnace. Its temperature is, in fact, higher; for not only does it share in the heat of the furnace, but its temperature is also raised by the heat which is disengaged by the chemical combination of the lead with the oxygen. When, however, the lead is completely oxydized, this second source of heat no longer exists; the metallic silver quickly sinks down to the temperature of the furnace, and instead of being brilliant as it was before, it becomes dull. On the other hand, at the moment when the last traces of lead oxydize, there is on the surface of the metallic bath only a pellicle of fused litharge; this quickly becomes thinner and thinner, and presents in rapid succession the colors of thin plates or of the soap-bubble, then becomes torn up like a vail, and discloses the surface of the metal. It is this rapid succession of optical phenomena to which the name of *l'eclair* or the "lightening" is applied. When very rich lead is operated on, the plate of silver may be worked off at once from the refinery. The litharge produced during the operation, as also the cupel bottoms, contains silver, and these are operated on for the recovery of that metal.

WAGNER'S METHOD OF ADJUSTING SAWS.



The accompanying figure is a perspective view of the mode of adjusting saws for sawing boards, planks, &c., of diffierent thicknesses, invented by I. Z. A. Wagner, of Philadelphia.

A is the upright of the frame. Y Y is the carriage way, and W W is the log carriage running on ways. H is the log. V V are the dogs to hold the log on the carriage. I is a vertical guide post (one on each side) for the saw sash, T T, to play up and down in. F F are the stretching rods, and T T the cross girts of the saw gate. S represents two saws hung in straps above and below. These straps are attached to boxes which have threads cut in them, and through which passes a screw rod, U. This screw rod has one half of its thread running from the middle to the right, and the other half running to the left—it is a right and left handed screw rod. One saw is secured on one half of the screw rod, the other saw on the opposite screw. The screw at the bottom of the sash is the same as the one at the top, and is operated in a like manner. J is an arbor-rod secured in the sash at one side, and has a bevel pinion on it meshing into the bevel wheel, K, which is operated by a handle. I are two bevel pinions, one on the end of rod J, and the other on the end of screw, U. There is also a bevel pinion on the lower end of rod J, meshing into one on the lower screw of the saw straps. This rod and bevel gear are attached to the gate, and move up and down with it.

If it is desired to shift the saws closer together, the handle of wheel K, is turned to the left, when the bevel gear will turn the upper and lower screw rod, U, and make the nut boxes of the saw straps approach one another, thus shortening the space between two saws, for cutting a thinner board or plank. By turning the handle of wheel K in the opposite direction, the screw rods will be operated to move the saws further apart for sawing out thicker stuff.

E is the driving shaft, which is rotated by a band from the main shaft. D is a fly wheel. C is a connecting rod attached below to a crank on the driving shaft, and by a joint above to the lower part of the saw gate, which it moves up and down as the shaft, E, rotates.

The method described and shown for adjusting the saws to cut stuff of different thicknesses is very simple, both in its arrangement and construction.

Mr. Wagner has taken measures to secure a patent for his improvement, and more information may be obtained respecting it by letter addressed to Wagner & Imlay, No. 2 South Delaware street, Philadelphia.

Pennsylvania Slate.

A correspondent of the Philadelphia *Ledger* gives a description of the slate mines in Lehigh Co., Pa., and the manufacture of slates, for schools and roofing, as carried on at Slatington.

These slate mines, five in number, are situated about two miles south of the Lehigh water gap. Out of one mine named the "Douglas," the soft school slates are obtained, and the roofing from the other four mines. The slates for schools are shaved like shingles with steel knives The machinery is driven by a large water wheel. In 1854, no less than 300,000 feet of lumber were used for slate frames. There are 131 persons employed in mining, and 30 in the factory. The first year the mines were operated, 1848, but one load of slates were sent to market, and in 1852, 2500 squares of roofing slates, and 800 cases of school slates were sold. Last year the sales amounted to 6000 squares of roofing, and 1600 cases of school slates, and so great is the demand, that with the limited accommodations for mining, 8000 squares of roofing, and 2400 cases, or about 250,000 school slates will be sent to market. In a few weeks, a factory 150 feet long, and 24 feet wide, is to be erected, so as to afford facilities for the manufacture of one million school slates annually, and a force of cutters is to be employed large enough to get out 40,000 squares of roof slates per annum. The slate is first cut out in the quarries, in thick square blocks of about twenty square feet, and are then split into pieces small enough for the workmen to handle easily. The small blocks are conveyed from the quarries on carts or cars to sheds, in which they are again split and cut into the many different sizes required for roofing and school purposes. When the blocks are first taken from the quarries, the miners keep them continually damp, in order to preserve the elasticity until they are prepared for market.

The ground upon which Slatington stands was a wheat field four years ago. Now it contains nearly fifty neat and comfortable brick, stone, and frame buildings, including a church, with an audience chamber, lecture room, and Sunday-school room, a store, and a hotel. A portion of the pulpit in the church is made of slate, highly polished, which presents a pretty appearance.

Lead is transported from Illinois and Wisconsin to New York, when it is converted into the carbonate—or white lead—as a paint, and sent back to the citizens of these States for painting their houses.

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